VARIEGATED GEOGRAPHIES OF ECOLOGICAL URBANIZATION: CHINA'S ECO-CITIES IN GLOBAL CONTEXT

A DISSERTATION
SUBMITTED TO THE FACULTY OF
UNIVERSITY OF MINNESOTA
BY

I-CHUN CATHERINE CHANG

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

HELGA LEITNER AND ERIC SHEPPARD
CO-ADVISERS

MARCH 2015

Acknowledgements

It has been a long journey. I still remember vividly the day when I arrived in Minnesota. I walked off the jet bridge from the McDonnell Douglas DC-9, holding two cats in both arms, standing next to my fiancé and four oversized suitcases. It was a hot dry August afternoon, but my mind was already imaging the snow and ice in the winter. Born and raised in Taiwan, I only had seen snow in movies and on the television. I was worried whether I would be able to complete my PhD at this unfamiliar place.

Miraculously, I did survive and finish this dissertation. But this journey would not have been possible without the warm and generous support from so many people and institutions. My deepest gratitude goes to my co-advisers, Dr. Helga Leitner and Dr. Eric Sheppard. Eric and Helga have been with me at each step throughout my graduate study. They are dedicated mentors who wholeheartedly support me to develop my intellectual curiosity while also pushing for rigorous research. Their encouragement helped me transform my ideas into a dissertation and find my own voice in thinking through theories. They patiently read all my papers, proposals, funding applications, and dissertation drafts in the past seven years, and never stopped offering critical comments and constructive suggestions. Their enthusiasm in research also sets a life-long example to me. Eric and Helga are the kind of researchers I hope I can grow to become.

My committee members, Dr. Michael Goldman, Dr. Brenda Kayzar and Dr. Yanjie Bian have also been my advocates over these years. Michael always helps me push my research forward. He encourages me to be ambitious in developing the long term research agenda, also assists me to frame action plans. His insight into Asian urbanization has influenced my research in many aspects. On the other hand, Brenda always offers me inspirations from North American cities and the urban design literature whenever I struggle to conceptualize my case studies in China. Coming to Minnesota in the same year, Brenda and I are also comrades in adapting to survive in the harsh winters, as well as making it as junior female geographers. Yanjie's insight about Chinese society is essential to my dissertation research. The special Mandarin interview training he put me through helped my field research in China immensely.

In the Department of Geography, I also benefited greatly from many faculty members, staff and friends. Vinay Gidwani, Abdi Samatar, Kathy Klink, Bruce Braun, Nikhil Anand, Rod Squires, George Henderson, Valentine Cadieux, Kurt Kipfmueller, Bonnie Williams, Jodi Larson, Glen Powell, Sara Braun and Cathy Dziuk all provided generous support for my research and graduate study during these years. My dear graduate fellow friends, Renata Blumberg and Ursula Lang, indulged me with their unconditional friendship in both academic and personal lives. They diligently comment on my works, cheer me up when I am frustrated, and share my girly secrets at coffee shops and in conference hotel rooms. Dudley Bonsel, Kate Kindervater, Jerry Shannon, Chris Strunk, Tatiana Matejskova, Chris William, Sami Eria, Ilona Moore, Ozan Karaman, Nathan Clough, Luke Bergmann, Sian Butcher, Alicia Lazzarini, Basil Mahayni, Sri Anantha, Harlan Morehouse, Julia Corwin, Lalit Batra, Asli Ikizoglu, Melinda Kernik, Joe Getzoff, Ding Fei, Raj Reddy, Ivan Bialostosky, Erin Walsh, Brook Bernini, among many others, kept me company during this academic journey. Friends

from Sociology Department, Yu-Ju Chien and Sinan Erensu, also enriched my life in the Social Science Tower.

I am also greatly indebted to many people who assisted my research work in Shanghai, Tianjin, Singapore and London. I am particularly grateful to Simon Joss who mentored my fieldwork in London, and to Fulong Wu and Li Yu who helped me advance my knowledge about urban planning in China. Elizabeth Rapoport, Federico Cugurullo, William Wu and Braulio Eduardo Morera provided me not only research advice but also their warm friendship. Jun Zhang, Ang Yang Chong, November Tan, Harvey Neo, Tim Bunnel, Victor Savage, and Choon Piew Pow offered great research support when I was in Singapore. I owe special thanks to Xiaofan Laun, Tsung-Yi Lee, Shu Jian Li, Shouyi Hao, Guangwen Meng, Yukai Xu, He Lei and Yaping Dong, who assisted me to conduct interviews in Shanghai and Tianjin. I would like also to thank urban planners, scholars and policy makers in the four cities who kindly shared with me their professional experiences. Most importantly, this dissertation research would not have been possible without those villagers, farmers, migrant workers and town residents in China who opened their doors to me and kindly shared their life stories.

Many institutions provided financial support for my graduate study and dissertation research. I received the Study Abroad Fellowship from the Ministry of Education in Taiwan, and the Doctoral Dissertation Fellowship from the Graduate School of the University of Minnesota. My dissertation research was funded by the National Science Foundation Doctoral Dissertation Improvement Grant, the Association of American Geographers Urban Geography Specialty Group Doctoral Research Fellowship, and the University of Minnesota Global Spotlight Doctoral Dissertation International Research Grant, Consortium on Law and Values in Health, Environment and the Life Sciences Graduate Research Grant, College of Liberal Arts Graduate Research Partnership Program Fellowship, and the International Thesis Research Grant.

Finally, I would like to thank my family. Por-Fu Aspen Chen, the fiancé who accompanied me to come to this country, is now my beloved husband. Living with a talented sociologist has been always exciting. He inspires me everyday at our dining table; he is my best friend, my partner of life, my English teacher, my patient reader, and my critical editor, among many other roles I am going to discover. My parents, Pi-Tao Chang and Su-Jane Chen, brought me up with the belief that a girl can be more than a wife and mother, and can achieve as much as a boy. My mother always has strong faith in me and allows me to explore and pursue my interests. My parents-in-law, Eric Chen, Yvonne Ho and Szu-Ping Lin, take me as their own daughter and unconditionally support my graduate study. Cousin-in-law Kenneth Lin filled my every stay in Singapore with lovely culture adventures. My two feline friends, Jaja and the late Meowko, have been my best dissertation writing assistants. While they sometimes accidentally delete a whole paragraph or intentionally add on several lines of mysterious codes, they do warm up my lap and keep me writing throughout the chilly Minnesota nights.

This dissertation is dedicated to all of you.

For Those Who are Fighting for a Better Urban Future

Variegated Geographies of Ecological Urbanization: China's Eco-Cities in Global Context

Abstract

This dissertation examines an emerging ecological urbanization paradigm: Eco-cities. Eco-cities promise to contain hyper-urbanization and eradicate urban environmental problems by building cities as sustainable ecological systems. Originated from the post-industrial societies in the global North, the eco-city paradigm transforms when it travels to, and navigates through, the local contexts in the global South. Different planning ideas and variegated practice emerge from this process. These ideas and practices become new standards of ecological urbanization, and circulate back to international communities as alternatives to compete with the original visions.

This dissertation undertook a relational comparative research on the Sino-British Shanghai Dongtan Eco-City and the Sino-Singaporean Tianjin Binhai Eco-City. These two projects represent distinct eco-city models, different from one another, and also from Western models. The two case studies were complemented by a multi-site investigation of the actors involved in the construction of these eco-city projects in Shanghai, Tianjin, Singapore, and London. Through archival research, in-person semi-structured and open-ended interviews, and participant observation at project sites, this dissertation first analyzes the particular form of ecological urbanization adopted by these two most prominent eco-city projects in China, and their relationships with Western eco-city principles. The dissertation further reveals how connectivities between the four sites shaped the development at each node.

The findings of this dissertation provide new insight into how green urbanism regimes function in China, and how eco-city models differentiate and variegate as they travel to the global South. They advance our understanding of the diffusion and dissemination of contemporary ecological urbanization agendas, their local variegations and mutations, and their external impact on the socio-spatial transformation of cities across the globe. Most importantly, the findings of this dissertation enable us to critically reflect on the adequacy of Western urban and sustainability theories for explaining emergent ecological urbanization paradigms in the global South.

Table of Contents

List of Tables

List of Figures

CHAPTER ONE

Introduction:

Variegated Geographies of Chinese Ecological Urbanization

The United Nations predicts that the majority—approximately five of eight billion people—of the world's population will be living in cities by 2030 (UN Habitat, 2008). This projection has sparked keen discussions about how to sustain the future urbanized world ecologically, environmentally, and economically. The increase of the world's urban dwellers is expected to bring about massive construction, consume vast amounts of natural resources, and deteriorate biophysical systems. Among the various solutions proposed to combat these challenges, the eco-city model (Register, 2002, 2006; White, 2002) stands out for its focus on innovative technologies and integrated and comprehensive urban designs. While eco-cities are built across the world, they have most embraced in China where rapid economic growth and rural-urban migration is taking place. Over 100 eco-city initiatives are launched in recent years (World Bank, 2009). My dissertation research focuses on the two most internationally renowned of these initiatives, Shanghai-Dongtan Eco-City and Tianjin-Binhai Eco-City (Dongtan Eco-City and Tianjin Eco-City hereafter).

Through a relational comparative study of Dongtan Eco-City and Tianjin Eco-City, my dissertation research seeks to elucidate the particular forms of urbanism that the

most prominent eco-cities are promoting in China, and also their relations with eco-city principles developed in Europe and North America. Dongtan Eco-City was designed in collaboration with the British architectural firm Arup, but its design deviates considerably from western eco-city norms (Chang and Sheppard, 2013). Features of Tianjin Eco-City, developed with the help of Singaporean government agencies and firms, are even more different from what early eco-city promoters depicted. Both projects are important models for other eco-cities in China, and also have become exemplars internationally through the promotion of international organizations, such as the World Bank Eco^2 Cities Initiatives and the C40 Cities Climate Leadership Group. These eco-city features also inform international urban planning communities in setting the construction standards for other eco-city projects. In light of the influences of the two eco-cities, my research studies how eco-city designs become locally variegated in the global South (China), and how the mobility of these designs in the international epistemic communities reshape the "best practice" in the global South and global North. Building on an emerging research agenda that seeks to understand how urban policies and practices are geographically variegated but globally connected by policy mobilities (often labeled as "policy mobility," "mobile urbanism," or "Southern urbanism"; Peck and Theodore, 2010; Peck, 2011), my dissertation argues that the two Chinese eco-cities initiatives are not the realization of Western eco-city ideas, but rather the cores of dynamic global and local processes in which new forms of ecological urbanism is shaped and distributed. Across the three papers in the dissertation, I take a multi-scalar approach to study the eco-urbanism in the making of both eco-cities. Respectively, I interrogate a) the green

developmental logics and rationalities underlying eco-city development, b) the roles played by local and international institutions, actors and policies, and c) the impact of Dongtan Eco-City and Tianjin Eco-City on global networks of eco-city designers and practitioners, as well as internationally circulated ecological urbanization paradigms.

1. Situating Chinese eco-cities in a variegated but relational geography

The eco-city concept surfaced in the U.S. and Western Europe in the 1970s, as an integrated approach to multiple urban sustainability remedies. It was proposed as a self-sufficient way of urban living to address the ills associated with industrialization and hyper-urbanization – an urban design featuring a compact living space, prosperous local economy, bioregions as city limits, and the prioritization of public transportation to reduce energy consumption (Register, 2002; 2006). Over the years, it has assumed center stage in the urban policy landscape, particularly given growing concerns about climate change and rapid urban growth in the global South. It is now widely embraced as an avenue to achieve urban sustainability, with many countries embarking on high-profile new eco-city projects, such as Masdar City (United Arab Emirates), the London Thames Gateway (UK), Gwang Gyo and Songdo (South Korea), or retrofitting eco-city concepts into pre-existing urban forms, such as Curitiba (Brazil), Freiburg (Germany) and Vaxjo (Sweden). Many more are currently under construction or planning in the global South, where the urbanization challenge is most severe (Joss, 2011).

The proliferating planning and construction of eco-cities across the globe raises the question of how urban sustainability concepts and practices may transform as they travel across space and through time. The original idea of an eco-city was born in post-industrial societies in the global North. This context explains why many of eco-cities' proponents favor a peculiar form of urbanism featuring local communities with minimal ecological footprints, a service-based economy, strong local civic participation, and egalitarian social relations (Roseland, 1997; Kenworthy, 2006; Suzuki et al, 2010). As eco-city models begin traveling to the global South where economic, political, and social conditions differ considerably, however, it is imperative to investigate how the original vision engages with local planning logics, rationalities and cultures.

Since the 2000s, China has embraced eco-city as a remedy for hyper-urbanization and environmental harms caused by industrialization. After more than two decades of rapid manufacturing-based economic growth at the cost of severe pollution, China now supports the pursuit of a new urbanism model that offers a symbiotic relation between economic development and environmental quality. To this end, eco-cities have been proposed as the tool to resolve the tension between urbanization, land appropriation and resource consumption. Newly built eco-cities are particularly preferred as they are claimed as capable of accommodating massive rural-to-urban migration, orienting city dwellers towards a sustainable lifestyle, and transforming China into a "greener" consumers' society. These claimed capacities of eco-cities fit perfectly with the overarching national development goal stated in China's recent 11th and 12th five year plans: building a sustainable society in harmony with the environment. Both the Ministry

of Environment and the Ministry of Housing and Urban-Rural Development propose new national eco-city policies in 2003 and 2004 respectively. In 2007, the political slogan, "Eco Civilization," was further invented and became widely circulated in governmental narratives, proclaiming that eco-cities would introduce an ecological lifestyle to all Chinese people and bring about the "leapfrog" era during which China surpasses Western industrialized nations.

Against this backdrop, China began partnering with foreign governments, private companies, and international planning professionals to pursue green economy and ecological urbanization objective in the mid-2000s. In 2005, China worked with the British government and a London-based consultancy, Arup, to build its first large-scale ecological urbanization project, Dongtan Eco-City, at the outskirts of Shanghai. The construction of Dongtan was halted in 2008, but international sustainability experts, the Chinese and British authorities, and news outlets have continued to promote Dongtan as an exemplary urban sustainability project, even citing Dongtan's master plan as a "best practice" of green urbanism (Pow and Neo, 2010; May, 2010). Drawing on this experience, the Chinese government initiated another national flagship eco-city project in 2008 in collaboration with Singapore. The project, Tianjin Eco-City, is located at the urban fringe of China's third largest city Tianjin, on the coast just two hours by car from Beijing, inside the special economic zone, Binhai New Area. Under construction since 2010, this project aims to become another urban sustainability model replicable for cities in China and around the world also facing challenges of massive population concentration and rapid economic growth.

Among more than a hundred Chinese eco-cities, Dongtan and Tianjin are of particular importance not just because they are prominent national exemplars, but also because these two cases effectively encapsulate the intricate spatial dynamics in China's contemporary urban development. On the one hand, Dongtan and Tianjin reflect localized practices, emerging at the intersection of Chinese ecological conditions, policy initiatives and socioeconomic context, also with respect to China's major metropolitan regions of Shanghai and Beijing. On the other hand, the international collaborations underlying both eco-city projects, and the projects' transformation into exemplary models, indicate the importance of both projects in global networks that drive the making of contemporary urban sustainability practices. The Dongtan and Tianjin Eco-City models not only reference one another, but also circulate between the global South and North (e.g., between China and the UK) and within the global South (e.g., between China and Singapore), exercising influence in the genealogical connectivities between eco-city experiments.

Nevertheless, current studies on Dongtan and Tianjin, also on other eco-cities, mostly approach these projects as isolated individual cases, and offer only descriptive or technical analyses of second-hand policy claims, planning documents and news outlets. They examine whether Dongtan exemplifies urban sustainability ideals (Sigrist, 2009; Pow and Neo, 2010), discuss the challenges of implementing eco-cities (Yang and Dong, 2008; Yip, 2008), or question how Tianjin Eco-City's experience can be used to develop indices and assessment measures for future projects (Low et al, 2009; World Bank, 2009; Qiu, 2009). These works tend to interpret Dongtan and Tianjin Eco-Cities as reflecting

China's unique context, either explicitly or implicitly embracing a "Chinese exceptionalism" that isolates ecological urbanization in China-specific explanations. Meanwhile, these studies also often uncritically treat urban sustainability paradigms developed in North America and Western Europe as the ideal trajectory or normative standard. There has been little effort to examine the connections between eco-cities and the articulation of their locally variegated practices with international eco-city paradigm and knowledge production networks.

In order to address this intellectual gap of understanding Chinese eco-cities, I take a relational approach that addresses the connections among cities at different scales, sensitive to local variegations and the dialectical relations of urbanization paradigms between the global North and global South. Examining rapid urbanization across the global South, this approach draws on post-colonial theory to question the presumption that "Southern" urbanization must follow the same trajectory as that observed in Europe and North America. Such studies seek to deconstruct urban theory that advances Northern, "global" cities, and the theories developed to make sense of these, as the model for all to emulate (Robinson, 2002; 2006; Sheppard et al, 2013). They note that "worlding" is underway in cities everywhere, large and small (Simone, 2004, 2010), seek "regional" theories attuned to the distinctiveness of these post-colonial contexts (Roy, 2009), and stress the importance of developing urban planning "from the South" (Pieterse and Watson, 2009; Roy, 2011; Roy and Ong, 2011) and of learning from such cities (McFarlane, 2010; 2011a). In this view, cities in the global South are not merely passive receptors of "northern" policy and planning models; rather, new models may emerge in

the South, in turn re-circulating back to international policy and professional networks and contributing to the development of new planning and policy standards elsewhere. This approach thus refuses the notion that "best practice" urbanism can always be traced to the global North, acknowledging the potential for progressive and alternative urbanisms to emerge locally and circulate widely (Robinson, 2011a; 2011b).

This approach, taking a relational perspective that does not privilege northern cities as the course of expertise, is complemented by scholarship on mobile urbanism and policy mobilities. This scholarship seeks to understand how the global diffusion of certain "best practice" urban policies does not simply underwrite a homogenization of urban governance: "actually existing" governance policies remain variegated (Brenner and Theodore, 2002; Brenner, 2004; Peck and Theodore, 2007; 2010; Peck, 2011). But variegation does not mean "exceptionalism" in any given city. It conceptualizes the prevalence of certain urban policy models as the result of interdependent social construction processes connecting multiple places, dialectically linking the local/urban with the global (McCann and Ward, 2011). Rejecting the rational-choice reading of urban policy transfer as an equilibrium diffusion process, it is argued that the landscape of urban policy and planning transfer is dynamic and not even. Urban policy and planning constantly mutate as policy programs journey through space and time, simultaneously constituting agency and the structure. Certain urban policy paradigms manage to endure by establishing inter-subjective frames of references and institutionalized centers of authority, and a wide array of actors and institutions are embedded in shifting conjunctures of strategic openings and preexisting preferences for a certain model of

urbanism (Peck, 2011). However, to date, the research programs on Southern and mobile urbanism and policy mobilities have paid little attention to issues of urban sustainability and ecological urbanism. It remains unclear as to how models of ecological urbanization, as an emergent paradigm of urban sustainability, are constructed in the current policy and planning landscape between the global North and the global South.

The relational approach to urban theory also has significant methodological implications for comparative research. A conventional comparative case study treats individual cities as stand-alone cases for comparison, either as representatives of different urban ideal types, or as similar in all but the one critical differentiating factor of interest. By contrast, relational urban theory argues that it is necessary to conduct comparative research by examining different cities not as place-bound exemplars, but as places relationally connected, both directly with one another and indirectly through supra-urban scale processes (including global institutions and actors, inter-urban policy norms and other worlding processes). More principles for relational comparative urban research are now emerging (Hannertz, 2003; Nijman, 2007; Robinson, 2011a; 2011b; McCann and Ward, 2010; McFarlane, 2010), and I deploy these principles in my case study of Dongtan and Tianjin.

2. Research questions

My dissertation investigates both local and global processes through a dynamic, relational and multi-scalar perspective that understands eco-cities as (re)produced in

specific social contexts, as intermediary between international sustainability discourses and local practices, and as embedded in globalizing social and material relations. This enables me to ask how the eco-city model transforms as it travels, how alternative urbanism models may have emerged to contest Western dominant norms, and whether contemporary theories can adequately capture and understand such interventions in Asia's urban development.

The organization of the dissertation is guided under a set of related questions that interrogate Chinese eco-cities at local, national, and international scales:

a) How does the eco-city model originating in the global North influence Chinese urbanization and economic development?
b) How does China's national environmental shape local eco-city practices?
c) How do Chinese eco-city projects affect global eco-city discourses and norms?

The next three chapters address these questions at different analytic scales. In chapter two, I detail how eco-city models have variegated at the local scale in the peculiar social, political and economic contexts. In chapter three, I focus on the national scale and question how eco-city development articulates with China's economic and environmental governance. In chapter four, I turn to the international scale and trace the trans-local circulation of eco-city models. (Figure 1.1)

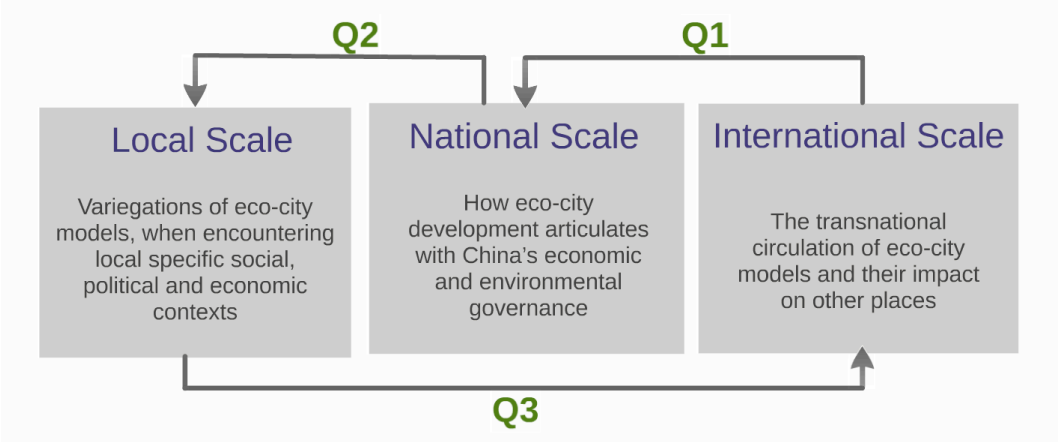


Figure 1.1 Three Scalar Research Foci

3. Research Methods

In order to understand how contemporary ecological urbanism is situated within both specific local contexts as well as in inter-urban and international networks of policies, knowledge, practices and social relations, my dissertation research used a multi-sited, multiple-method research design that collects data from archival research, textual and discourse analysis, in-person semi-structured and open-ended interviews, and on-site observation. Informed by the relational approach, my research methods were chosen to reveal how the mutual and dynamic constitution of agency and structure shapes this new paradigm of ecological urbanization, and enables the traveling of eco-city models and the making of urban space in China and beyond. To effectively examine urban policies, existing research under this tradition suggests that it is crucial to study policy makers,

experts, and regulators who act in and across urban and global scales (Peck, 2011; McCann and Ward, 2011; Robinson, 2011b; Roy, 2011). Following this lead, I documented in detail the variegated urban forms emerging through mutual and dynamic constitution of agency and structure. I situated Dongtan and Binhai in both local and global processes, and triangulated information across the four geographical sites (Shanghai, Tianjin, London and Singapore) that are most important in the making of these two eco-cities. The dissertation research design and methods are detailed in the following.

In order to thoroughly understand the two eco-city projects, I began with a historical review of the plans of Dongtan Eco-City and Tianjin Eco-City that were proposed by different institutions and consulting agencies. I collected the master and control plans of Dongtan and Tianjin, which allowed me to examine the land use regulations, building codes, public transportation, pollution regulations and waste management, energy and resource use regulations, and green economic development initiatives. I also undertook a comparative analysis of the local, national, and international policy discourses on ecological urbanization and urban sustainability pertaining to Dongtan and Tianjin. All of these analyses were complemented with on-site research at both places, during which I collected archival and interview data in order to better understand how the project plans were developed and modified over time.

Document research has been conducted since 2010 based on the following materials: a) technical reports and documents concerning sustainability policies in China in general and related to Dongtan and Tianjin in particular; b) government publications;

c) brochures and educational booklets on urban sustainability and eco-cities; d) press releases; e) online resources (such as websites and blogs of sustainability and eco-city advocacy groups); and f) academic publications. I use these documents to understand the rationales and thinking about eco-cities emerging with respect to and circulating around the Dongtan and Tianjin Eco-City projects.

Interviews, discussions, and participant observation were conducted in Shanghai, Tianjin, London and Singapore between 2010 and 2013. First round of interviews were conducted between 2010 and 2011 with Chinese actors involved in the projects, including key informants working in public agencies and private firms, professionals in local and international planning organizations, urban planning scholars in universities and research institutes, and other local actors and stakeholders (discussed below). On-site observation between 2010 and 2012 at Dongtan Eco-City and Tianjin Eco-City further allowed me to understand the contextual meanings for eco-city actors, and their unspoken rationales. Together, the interviews and observation helped me tease out and situate local developmental logics, rationalities, and conceptualization of the two projects at different locales. These data help incorporate the views of local communities and Chinese officials on ecological urbanization and sustainability, and compare that to those from international sustainability advocacy communities.

Through these primary and secondary data collected between 2010 and 2012, I was able to identify major local and international actors in Dongtan Eco-City and Tianjin Eco-City, trace their actions, and analyze their reasonings during the projects' planning and implementation process. Below is a list of the major actors.

a) Government officials and workers. These include Chinese and British government personnel working for Dongtan Eco-City, and the Chinese and Singapore government personnel working for Tianjin Eco-City.

b) Sustainability planning technocrats and sustainability experts. The technocrats and experts who worked on Dongtan Eco-City are mainly affiliated with Tonji University and East China Normal University in China, or with the United Nations' Environmental Program, University of College London, Imperial College London, and University of Southampton in the UK. Those working on Tianjin Eco-City are mainly affiliated with the Sino-Singapore Tianjin Eco-City Administrative Committee, the Chinese Academy of Urban Planning and Design, the Tianjin Institute of Urban Planning and Design in China, the Ministry of National Development of Singapore and its subordinating Urban Redevelopment Authority and the Housing and Development Board, and the National University of Singapore.

c) Professionals in urban planning, architectural industries and real estate development. In Dongtan Eco-City, these professionals mostly work for the Shanghai Industrial Investment Company (China), ARUP (UK), or Sustainable Development Capital (UK). In Tianjin Eco-City, they work for Bluepath (China), Keppel Corporation (Singapore) and the semi-governmental planning firms Surbana and Jurong (Singapore).

d) International development organizations and policy and research networks. These organizations and networks include World Bank Eco^2 Cities Initiatives, the UN

Habitat, the United Nations Industrial Development Organization, the Clinton Foundation Climate Initiative and the International Eco-Cities Initiative.

e) Local residents at or near both project sites.

I conducted second round of interviews with these identified major actors in both projects between 2011 and 2013. In addition to tracking actors' actions and rationales, these interviews also focused on determining which kinds of connections and networks have emerged between Shanghai, Tianjin, London, Singapore, and with global policy networks, which actors have been key within these, and how these networks have been influencing the two eco-city projects. These interviews are essential to mapping the knowledge production process and policy transfer between eco-city planning communities in and across four cities, providing insights into how these two particular ecological urbanization models are being constructed across places and scales.

Beginning in 2013, I have also traced how key actors in the Dongtan and Tianjin projects subsequently involve in other eco-cities. This line of work intends to uncover the venues/channels through which knowledge about eco-cities is circulated, such as academic collaboration, international organizational initiatives, business consulting practices, regular events (conferences, business meetings, study trips etc.), governmental collaboration and information exchanges, and Chinese diaspora connections. When necessary, I conducted follow-up in-person interviews, phone interviews and email correspondence with key actors and informants. Chapter two, three, and four also have separate methodology sections to further detail research methods and data analysis.

4. Outline of the chapters

The major findings of my dissertation research are presented in the next three chapters. These chapters are written in the style as journal articles. Instead of proposing an overall framework, each chapter engages with separate literatures most relevant to the particular empirical findings at the local, the national and the trans-local/international scales. These three chapters together contextualize the planning and implementation of Dongtan Eco-City and Tianjin Eco-City, and explore their influences on China's ecological urbanization agenda as well as international eco-city paradigms.

Chapter two focuses on the variegations of eco-city planning at the local scale, using Dongtan Eco-City and associated Chongming Eco-Island constructions as the case study. This chapter challenges the prevailing environmental sustainability discourses that suggest the essential interdependency between urban sustainability and economic competitiveness. Under these policy discourses, cities are designated as strategic geographical locales for fulfilling the green capitalist goal of reconciling the contradictions between environment and development that long have bedeviled capitalism. Dongtan Eco-City was also proposed with these discourses. While most urban sustainability agendas (including eco-city) are crafted based on the experience of post-industrial countries, the promise of green capitalism and sustainability faces different challenges where industrial production still dominates the economy. However, research on whether and how urban sustainability policies are geographically variegated is still sparse, particularly beyond Western (post)industrial capitalism. Through examining the

Dongtan Eco-City project and associated Chongming Eco-Island project in Shanghai, this chapter reveals how sustainability is imagined and practiced on the ground within the distinctive Chinese context. The meanings of sustainability in Dongtan and Chongming reflect the context of Chinese urbanization in the Shanghai area. Both Dongtan and Chongming projects seek to develop green technologies as the means to resolve the tension between urbanization and agricultural production. This approach is also shaped by Chongming's Island geography as enabling a self-sufficient development trajectory, and its desire to attract a cosmopolitan population. In these place-specific contexts, the ecology and economy of the Dongtan and Chongming become intertwined, producing and reproducing a variegated form of urban sustainability, and of "green capitalism."

Chapter three focuses on how the two eco-cities articulate with Chinese eco-city movement at the national scale, with a particular focus on Tianjin Eco-City. Since the early 2000s, China has been promoting eco-city designation and construction initiatives through which more than 90 percent of its local prefectures now have at least one eco-city project in planning or under construction. This chapter aims to understand this movement through an eco-state restructuring perspective that examines the reorganization of state powers, capacities, regulations, territoriality and strategic projects surrounding environmental governance. I argue that China's eco-state restructuring from a growth-first approach towards an ecological urbanization agenda is embedded within the country's broader regulatory transformation from the traditional socialist regime, to the market reform, to now the new post-economic-crisis stage. I examine how Chinese eco-city initiatives align with this reorganization of state-economy relations, and emerge

as a major strategy to manage urbanization challenges. While Dongtan Eco-City embodies the then entrepreneurial, internationally connected, and local autonomous focus of China's governing regime, the rise of Tianjin as China's flagship eco-city project can be construed as part of the regime's rebalancing act towards, among other things, greater power concentration, a more Asian/Chinese-focused strategy, and more even regional development. Under this shift, Tianjin Eco-City represents an eco-city model built to be replicable anywhere in China and also to demonstrate a Chinese/Asian mode of success (through collaboration with what many Chinese perceive as the more "advanced" Chinese society in Singapore). Through detailed case study analysis, I also examine the tensions between the model plans and the realization at Tianjin Eco-City. These tensions reflect how state strategies cascade through different scales of territoriality, and evolve as a result of various rationales, interests, contestations and negotiations in the pursuit of ecological urbanization.

Chapter four focuses on the trans-local circulation of the two eco-city planning models from Dongtan and Tianjin. The circulations occur between cities in China, within transnational professional planning communities, and to other international cities. Situating Dongtan and Tianjin Eco-Cities in a wider globalizing process, this chapter examines the involvement of diverse actors and the assemblage of complex social and material relations connecting places near and far that shape the development of Chinese eco-urbanism. Through a relational perspective, this paper analyzes the construction of the eco-cities through the genealogical connectivities of the two projects that spread across four geographical sites (Shanghai, Tianjin, London, Singapore). While confronting

contestations common among urban projects in transplanting “best practices” into a new place, the current Chinese national eco-city model (developed based on Tianjin Eco-City) particularly feeds on the failure of China’s first eco-city at Dongtan. This failure has set off a series of reforms on China’s planning institutions and political systems, which in turn facilitated the nation’s expanding ecological urbanization experiments. Meanwhile, the ecological experiments proposed in these two projects have also generated and rebranded planning technology and knowledge that circulate within international sustainable planning epistemic networks and reshaped urban sustainable projects outside China. This chapter therefore speaks to the literature of mobile urbanism through challenging the policy transfer paradigm’s bias towards successful examples, and tease out the intricacies of assemblage, mutation and inter-referencing of planning expertise between the global North and the global South.

My dissertation ends with a synthesized conclusion in chapter five, discussing my major findings in relation to other scholarships on urban development. Based on the case studies, I place the subject of eco-cities in the context of urban development challenges common in developing countries. I discuss some possible implications of this popular ecological urbanization model, and points out future research directions that reconsider issues of social, environmental and economic sustainability in ecological urbanization process.

CHAPTER TWO

China's Eco-Cities as Variegated Urban Sustainability:

Dongtan Eco-City and Chongming Eco-Island

Particularly as the global economy stagnates, policy frameworks such as "the Green New Deal", "green competitiveness" or "eco-economic stimulus packages" portray environmental sustainability as a growth opportunity. This greening of capitalism challenges conventional thinking on economic development. Since the rise of industrial production in 18th century Europe, the persistence and expansion of industrial capitalism was seen as predicated on the exploitation of natural resources (O'Conner, 1998). In contrast, claims for green capitalism maintain that environmental sustainability and economic competitiveness can be mutually enhancing (Gibbs, 2009).

Cities have become a major focus of policy discourses and proposals propounding environmental sustainability and green capitalism. Previously blamed for their exploitation of the environment, cities are increasingly presented as the hope for sustaining humanity, and the source of new environmental remedies and experiments (Davis, 2010). Urban sustainability policies highlight the role of cities as strategic geographical locales for the emergence, translation, circulation and realization of sustainability, at all scales. Correspondingly, urban sustainability agendas have become a primary concern for scholars and policy makers over the last two decades, increasingly

coupled with proposed solutions for long-term economic sustainability. For example, the World Bank's Eco^2 Cities Initiative seeks to help cities "build on the synergy and interdependence of ecological sustainability and economic sustainability and the fundamental ability of these to reinforce and strengthen each other in the urban context" (Suzuki et al, 2010: xviii).

Sustainability initiatives like Eco^2 Cities significantly contribute to envisioning a symbiosis of urban ecology and urban economy in contemporary urban policies, shaping the construction of green urbanism and closely related eco-city projects in the pan-Asian area. Yet dominant urban sustainability initiatives were produced within the historical contingencies of "post-industrial" Europe and North America. The urban sustainability agenda emerged in the 1970s in response to post-war urban sprawl, particularly in North America, subsequently acquiring an egalitarian disposition in the context of Western environmental movements and middle-class politics in the 1980s and 1990s. This agenda also has been susceptible to changes in the global political economy. When Anglo-American neoliberal capitalism seemed dominant, in the late 1970s to early 1990s, sustainability discourses focused primarily on assisting less developed countries with issues like over-population, over-urbanization, and poverty. With Anglo-American economic hegemony declining, attention there has shifted toward maintaining self-reliant local communities.

These contexts underwriting the dominant sustainability agenda pay little attention to developments outside Western advanced capitalist countries. In East Asia, urban sustainability should be re-read through the specific contexts of national and urban

economies, urbanization patterns, and developmental ideologies. Research exists on the variegation of capitalism, with limited attention to interrogating East Asian variants, but limited attention has been devoted to variegated urban sustainability practices and policies, with almost none beyond Europe and North America.[1]

In this chapter, I seek to enrich understandings of variegated urban sustainability policies and practices, using the case study of urban sustainability and green capitalism in Dongtan Eco-City and the socio-spatially associated Chongming Eco-Island project, near Shanghai, China. China has come to be seen as the world's factory, a place of over-population, with an acute urban-rural contrast, a developmental mindset and a strong state—a very different context to that of post-industrialism. Focusing on the social construction of these related projects, I interrogate local actors' conceptualizations of and meanings given to urban sustainability, arguing that for Dongtan and Chongming these must be placed within the context of urbanization in the Shanghai area. Stated intents behind these projects have been to build local industrial sectors in green technologies as a solution to tensions between urbanization and agriculture, a vision that also reflects Chongming's island geography, but also the desire to create a cosmopolitan city. In this place-specific context, the ecology and economy of Dongtan and Chongming have

[1] The use of "variegated" here draws from the emerging research paradigm of "Variegated Capitalism", a theoretical approach that complicates the Varieties of Capitalism school of global political economy (Peck and Theodore 2007). The Varieties of Capitalism literature maintains that capitalism has multiple forms, particularly laissez-faire vs. corporatist capitalism, seeking to understand the differentiated evolution of capitalist governance in national economies. Variegated capitalism focuses on geographical differentiation across different spatial scales and places, approaching capitalism as the representation and reconstruction of conjunctural processes comprising grounded political actions, institutional reinventions, and articulations with socio-regulatory transformations. Adopting this approach, I maintain that urban sustainability practices reflect conjunctural experimentations shaped by local contestations, contradictory evolutions, and multi-scalar regulatory forces (Peck, 2010).

intertwined to (re)produce a variegated form of urban sustainability that differs from western eco-city norms. Dongtan Eco-City project was indefinitely suspended in 2008, but remains worthy of study in seeking to understand variegated eco-city policies and practices. As I discuss below, Dongtan remains influential in Chine and abroad. In China, it was resumed as part of the wider, undergoing Chongming Eco-Island project and became a referred model for China's current high-profile eco-city in Tianjin. Beyond China, Dongtan Eco-City planning principles are circulated as eco-city "best practices", for example through the international C40 Cities Climate Leadership Group supported by the Clinton Foundation.

1. Sustainability, green capitalism and eco-cities

Two influential publications shaped current conceptualizations of sustainability. *The Limits to Growth* (Meadows, 1972) and to *Our Common Future* (WCED, 1987) drew wide attention to environmental constraints on economic growth. In these accounts, urbanization was presented as a challenge to sustainability, consuming considerable natural resources, producing heat-island effects, and catalyzing environmental and social problems (WCED, 1987: 241-243, Meadows, 1972: 73). UN Habitat subsequently took the opposite position, arguing that cities, with their compactness, large populations and agglomeration economies, can provide unique opportunities for reducing environmental damage at low average costs by improving public infrastructures and services (UNCHS, 1996).

Whether seen as a problem or a solution in sustainability studies, cities are framed as objects that need to be "cured", "reined in" and "directed" towards a more sustainable future. This perception has underwritten a policy toolkit of urban sustainability remedies proposing to balance economic development, environmental production and social equality, using such tools as: land use regulation, low-carbon and public transportation, pollution prevention and reduction, energy and resource conservation, "smart-growth" and compact development initiatives, and democratic and participation-oriented governance (Meadows, 1999; Portney, 2003). Yet cities are not simply policy objects—geographical units awaiting governance. They play an active role in constructing their ecologies and have become proactive contributors to crafting sustainability discourses and practices. Locally, an emerging paradigm of "actually existing sustainability" has been proposed to make sense of the variety of burgeoning bottom-up sustainability agendas and practices (Krueger and Agyman, 2005). Internationally, proliferating transnational urban networks and intra-urban organizations proactively propagate sustainability policymaking across space. A number of cities also market their sustainability practices to others, wielding considerable influence over urban ecological landscapes beyond their own locality (Bulkeley, 2005; Fitzgerald, 2010; Hodson and Marvin, 2009; 2010). Bringing these processes together requires a dynamic, relational and multi-scalar perspective that understands urban sustainability, green urbanism initiatives and eco-cities as (re)produced in specific social contexts, and as intermediating between global sustainability discourses and local practices.

Drawing on pre-existing urban planning tools, eco-cities were proposed as a novel end in themselves: as an integrated sustainable urbanism that addresses multiple urban issues simultaneously (Register, 1987; Beatley, 1999; Suzuki et al., 2010). Eco-cities, a term coined by Register (1987) expressing the principle that human settlements can be ecologically sustainable and livable, are often traced to Ebenezer Howard's "Garden City" movement, which brought nature back into cities through carefully allocating greenbelts, residences, industry and agriculture. Through proliferating policy discourses of and academic research on urban sustainability in the past three decades, the eco-city vision has been revised into a more pragmatic urban planning paradigm, incorporated into urban sustainability policy agendas. Register's (2002) influential *Ecocities: Building Cities in Balance with Nature* argues that eco-cities should be designed from scratch to be compact and for living beings, fit the bioregion and heal the biosphere, reduce energy consumption, promote social equity, community and health, prioritize pedestrians and bicycles, and contribute to the economy (pp. 174-6). In White's terms (2002: 3) an eco-city "provides an acceptable standard of living for its human occupants without depleting the ecosystem and biochemical cycle on which it depends." The World Bank defines eco-cities as places that "strive to function harmoniously with natural systems and value their ecological assets, as well as the regional and global ecosystems on which we depend.… [T]hey drastically reduce the net damage to the local and global environment, while improving the overall well-being of their citizens and the local economy" (Suzuki et al, 2010: xvii). In short, eco-cities express the possibility for an urban future in which urban growth becomes compatible with ecological processes.

Eco-cities and green capitalism

After an earlier politics of sustainability predominantly led by international organizations and national governments, there has been a noticeable increase of private sector actors participating in current environmental politics (in domains of climate change in particular). This increased participation has been dubbed "green capitalism", which refers to "a set of responses to environmental change and environmentalism that relies on harnessing capital investment, individual choices, and entrepreneurial innovation to the green cause" (Prudham, 2009: 1595). A core principle of green capitalism is that market-based mechanisms and economic efficiency can be harnessed to tackle environmental problems. Abstractly, green capitalism commodifies nature, incorporating and internalizing ecological processes into circuits of capital accumulation.[2] This attaches environmental politics, semiotically and ideologically, to the reproduction of conditions of capital accumulation (Smith, 2008; Prudham, 2009:1596). Green capitalism connects with eco-cities in two principal ways. First, recent narratives of eco-cities massively emphasize "selling the nature" of eco-city sites. Whether nature is inherited (e.g., the natural wetlands of Chongming Island) or human-produced (e.g., Masdar City's manufactured oasis in the United Arab Emirates), an eco-city's ecology is drawn into "place-branding" that differentiates it, as a commodity, from others. Eco-cities are thus "themed" and capitalized through regional differences in urban nature

[2] i.e., the commercialization and commodification of second nature (O'Connor, 1998).

(Prytherch, 2002; Hudson and Marvin, 2009; 2010).[3] Second, the eco-city sustainability paradigm emphasizes environmental governance through community-driven environmental regulation, green consumerism, best practice environmental management technologies, and eco-monetary tools (for example, household-produced energy trade and green accounting). Such environmental governance deviates from traditional "command-and-control" approaches to incorporate neoliberal doctrines, paralleling the shift from managerialism to entrepreneurialism in urban governance more generally (Leitner, 1990).

This approach to eco-cities generates some fundamental contradictions. First, in the literature on entrepreneurial cities environmentalists' concern for urban nature and ecology is generally associated with anti-urban and anti-growth politics, contesting urban growth coalitions. Secondly, when eco-cities capitalize on their natural ecology to promote urban growth, this may undermine these same ecological conditions: "entrepreneurialism constructs nature only to promote its destruction" (Prytherch, 2002:787). Prytherch's analysis suggests two important questions about eco-cities, as an expression of green capitalism: Why and how does an eco-city capitalize on its nature/ecology? How can an eco-city be legitimized given immanent contradictions between ecology and economy?

[3] Prytherch (2002) shows how even Tucson, Arizona, became an eco-entrepreneurial city.

Variegated eco-city practices

Design principles for eco-cities, as discussed above, emerged from the particular context of a post-industrial (deindustrializing) Europe and North America, where the vast majority of the population lives in cities. In this context, sustainability in general, and eco-cities in particular, stress compact, self-sufficient communities with minimal ecological impact, constrained economic growth, orientation toward the locality, community participation and social equity. This should not be taken as the norm for an eco-city, however. Socioeconomic policies never produce 'pure' models against which others are to be judged. It is "not a matter of measuring degrees of deviation from a supposedly paradigmatic norm… or perfect form; it calls for…qualitative analysis of conjunctures and connections" (Peck, 2010: 33). Eco-cities should thus be analyzed through the same relational perspective as discussed above for urban sustainability more generally.

I interrogate how an eco-city/eco-island project was conceived and planned in Dongtan and Chongming, outside Shanghai, examining how they (dis)articulate with prevailing sustainability discourses. In so doing, I attempt to disentangle the relationship between economy and ecology of eco-cities in China's industrializing, fast growing and rapidly urbanizing context, under the guiding hand of a strong state. Dongtan Eco-City and Chongming Eco-Island projects belong to a global diffusion of urban sustainability initiatives, embedded in and layered onto pre-existing socioeconomic institutions and cultural contexts. This multi-scalar relationship creates geographically variegated eco-

city practices and norms. With limited space, I focus particularly on the local context of how ecology and economy are intertwined.

2. Methodology

I draw on archival research documenting Dongtan Eco-City since 2005 and Chongming Eco-Island since 2006, together with field research in Shanghai City and on Chongming in Summer 2010. Archival research includes reports and documents concerning sustainability policies (for China, Dongtan and Chongming), government publications, sustainability and eco-city brochures and educational booklets, press coverage, online resources (such as sustainability internet groups and Chinese eco-city advocacy blogs), and academic publications.

Through the archival research I identified key informants to interview. Invitations were sent in the summer of 2010 to 27 relevant knowledgeable local informants, in academia, local government and associated planning institutes. Since its suspension in 2008, Dongtan Eco-City has become taboo among local government officials and planning professionals, only six of whom accepted our interview invitation. Although the number of key informant interviews might be comparatively small, these informants held critical professional positions enabling them to provide sufficient information for us to reconstruct the eco-projects' development. Semi-structured interviews were conducted with each informant, mostly in Mandarin and usually lasting between sixty and ninety minutes. Informal interviews were also conducted with eleven local households who once

lived on the Dongtan Eco-City and Chongming Eco-Island construction sites. Participant observation was undertaken throughout the four weeks of fieldwork.

This chapter draws heavily on these interview data, triangulated with participant observation and archival research, and in consultation with local long-term eco-city observers. While each interview highlights different aspects of these eco-projects, their perspectives in reading the process of eco-development display considerable consistency. Interview quotes were selected based on informants' professional position and the clarity of their statements; for local residents' interviews, quote selection largely is based on clarity.

3. Dongtan Eco-City and Chongming Eco-Island

Dongtan Eco-City was a Sino-British project under planning and implementation since 2005, located at the east end of Chongming Island in the mouth of Yangtze River north of Shanghai (Figure 2.1). A joint project of Arup (a London-based transnational engineering and design firm), the Shanghai Industrial Investment Company (SIIC, a Shanghai municipal government public-private pharmaceutical and real estate company listed on Hong Kong's stock market), as well as Chinese and British state agencies, universities, and planning institutions, the intent was to create an ecologically, socially and economically self-sufficient city. Other participants included Sustainable Development Capital LLP (finance); Monitor Group (consultant); with the Hong Kong and Shanghai Banking Corporation (HSBC), Rider Levett Bucknall, Jones Lang LaSalle,

and CB Richard Ellis acting as real estate development consultants. Chongming's county government subsequently established several relevant construction and real estate companies, seeking to raise Chongming's visibility in the domestic housing market by building eco-housing in and around the Dongtan site.

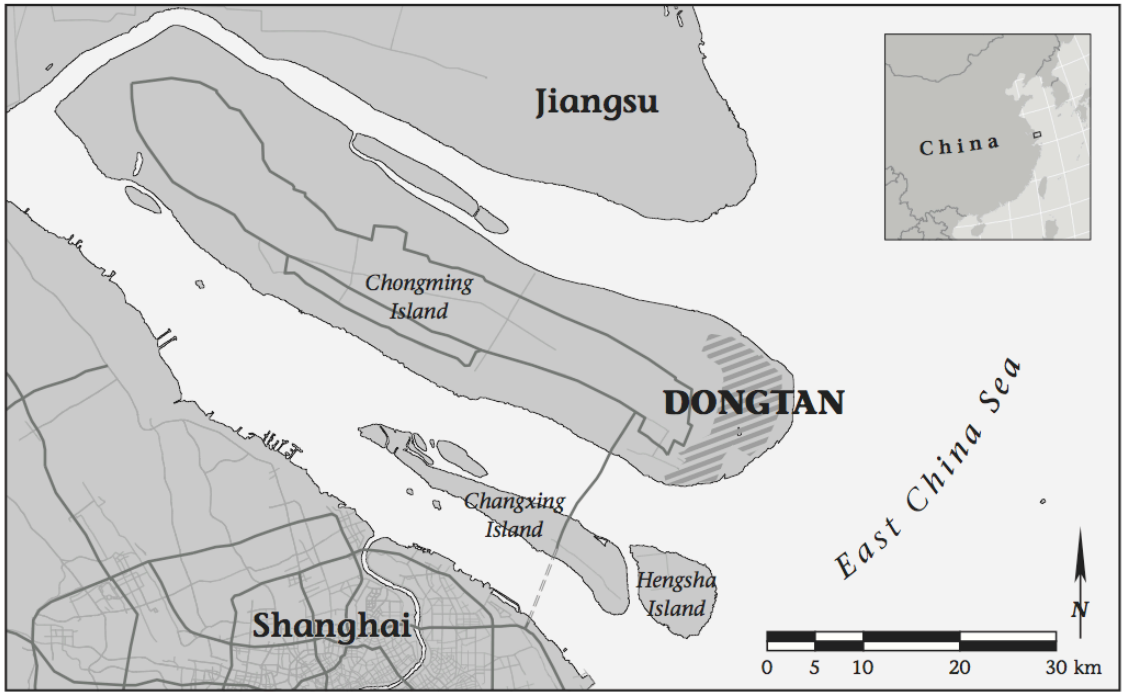


Figure 2.1 Dongtan, Chongming and Shanghai
(prepared by Mark Lindberg)

Arup's original plan was to create a city with a 60% smaller ecological footprint, 66% reduction in energy demand, 40% energy use from bio-energy, 100% renewable energy use for buildings, on-site transportation, 83% reduction of landfill waste, and

almost no carbon emissions. Dongtan was envisioned as a compact city with low-rise condominiums and high-tech energy-saving homes interspersed with green spaces. The city would rely completely on electricity generated by burning rice husks, and from solar panels and wind turbines. Organic "plant factories" would be installed underground using solar powered LED lights, and only zero-carbon-emission vehicles would be permitted to operate in the area. The waste management system would utilize recycling, reuse, and organic waste methods. Consumer-driven green-governance would be promoted, encouraging local residents to conserve energy through smart metering and financial incentives (SIIC, 2006; Arup, 2008). While on the outskirts of Shanghai, Dongtan was not planned as another dormitory town for Shanghai commuters. Instead, it was projected to become a city of 500,000 people employed locally in businesses, ecotourism, ecological/environmental related education institutions, and research and development firms. Three villages were planned, to be surrounded by farms, parks and wetland, with the city growing along public transportation corridors. Only 40% of Chongming Island was planned for urban use, with the remainder expected to remain under agricultural production. Current agriculture and fishing activities would be moved back from the coast, creating a 3.5 km wide "buffer-zone" for migratory birds along Chongming's eastern fringe.

Dongtan Eco-City was indefinitely postponed in 2008, however, and among local government officials and planners is currently considered a failed project. This suspension is attributed to several political and economic reasons. First, Dongtan Eco-City was the signature political project of previous Shanghai mayor Chen Liangyu, who

was arrested and jailed for corruption in 2008. Although there is no direct evidence that Dongtan's suspension is a result of Chen's corruption, it is generally believed that Dongtan Eco-City lost political priority both locally and nationally with his waning political influence (Brenhouse, 2010). Second, the project site selection and market positioning of the project have been criticized (Qiu, 2011; Wu, 2012). Planned on a conservation wetland to host exclusively high-end residential property, Dongtan was perceived as both harmful to the ecologically sensitive Yangtze estuary and incapable of supplying necessary job opportunities and economic activities for a economically self-sufficient eco-city. Also the location of the island, about 60 kilometers away from downtown Shanghai with no land transportation options before 2010, is argued to have discouraged investors. Third, the financial plan for Dongtan Eco-City was judged to be infeasible. As Wu (2012) notes, Dongtan's master plan was very much a "brainstorming exercise" without realistic consideration of financial feasibility. Nevertheless, there have been rampant rumors in international planning communities since the summer of 2011 that SIIC will resume the project.

Inspired by Dongtan, in 2006 the Shanghai Municipal Government and Chongming County government issued the *Chongming Three Island Master Plan*, covering the rest of Chongming County outside Dongtan Eco-City. This was a locally-driven independent plan based on Arup's proposal, focusing on smaller-scale environmental improvements and aiming to develop Chongming Island and two small surrounding islands (Changxing and Hensha) into "eco-islands". Land on all three islands is zoned into several functional regions, including ecological system demonstration areas,

leisure and tourism, sport and vacation, a garden city, education and innovation, forest, theme park, conference center and offices, and a shipbuilding industry special area (Shanghai Municipal Government, 2006). This was further developed into *Chongming Eco-Island Development Outline 2010-2020* in January 2010, featuring eco-tourism, technological-intensive organic agriculture, and long-term development plans for green industries (Shanghai Development and Reform Commission, 2010). This has catalyzed the completion of several tourist farms, vocation homes, forest and wetland parks, a conference center with a five-star hotel, and trail routes.[4] In 2009 and 2010, parts of some agricultural villages at the eastern end of the island were relocated to create space for modern high-rise housing, currently under construction.

Both the Dongtan and Chongming projects connect green urbanism with sustainable ecological cycles, aligning them with China's "Circular Economy" eco-reform – a centrally-driven campaign aiming at developing state-of-the-art energy efficient technologies, promoting environmental industries, and achieving close-looped circulation of energy and scarce resources in all industries, in building design, and in rapidly developing cities. Dongtan and Chongming are thus framed as development models for other Chinese cities, but also circulate beyond China. London originally pledged to base its proposed Thames Gateway Eco-region Project on Dongtan. Arup still continuously cites Dongtan as best practice sustainable urbanism within international interurban policy networks and professional communities, signing green development contracts with several Chinese cities on the basis of the Dongtan proposal (Fox, 2010;

[4] See Chongming County Tourism Bureau website: http://www.cmtravel.com.cn/webcm/

May, 2010). Although the location of Dongtan and Chongming in ecologically sensitive area was controversial, their design also became referred to as a model for the currently active high-profile Sino-Singaporean Tianjin Eco-City and nearby Binhai Tourism Area.[5]

4. Eco-cities with "Chinese characteristics"

On the ground, Dongtan/Chongming inevitably differ from Arup's proposed eco-city plan; planned constructions are rarely materialized. Beyond this, however, the distinctive Chinese context in which Dongtan/Chonming are developed has shaped practices that variegate from those normalized as the eco-city vision of European and North American scholars and planners. To tease out these aspects of "actually existing sustainability," I investigate the social construction of these projects in light of the place-specific context of the Shanghai region, examining distinctive aspects of how they were conceived, planned and executed. I focus on four such aspects: Dongtan's green development rationale; the trajectory of Chinese urbanization; the geographical imaginary associated with being an island; and the goal of creating a cosmopolitan community.

[5] According to interviews with a project manager at Tianjin Municipal government-funded Tianjin Binhai Tourism Area Construction and Development Company (September 24, 2011), and a planner at the Tianjin Ecocity Construction Bureau (September 29, 2011).

Ecology or economy? Dongtan's green development rationale

> "It is no gimmick. It is being led at the highest levels of the Chinese government. They are very committed to developing a new paradigm of *economic development*." (Peter Head, Arup director in charge of Dongtan Eco-City, quoted in Kane, 2005. Authors' emphasis)

The original rationale for building Dongtan seemed to coincide with eco-city proponents' visions of cities that balance growth with sustainability. In *Focus Magazine* (December 2008) Roger Wood, Associate Director at Arup, described Dongtan as a new approach to cope with China's rapid urbanization and urban resource utilization: "rather than just design a city in the same way we'd done it before, we can focus on how to minimize the use of resources to show that there is a different way" (Taylor, 2008: 45). Adopting novel green technologies, planning codes, waste management, public transportation and energy saving methods, Dongtan's urban design would exemplify an integrated-urbanism approach, decreasing the average ecological footprint and implementing a closed urban energy circulation system with zero carbon emissions. For Arup, developing such a holistic approach would make Dongtan's urban design a prominent innovation in urban sustainability.

Notwithstanding Arup's vision, the regional political goal for Dongtan aligned more closely with traditional economic development. Except for conserving wetlands for migratory birds, in areas already placed under protection by the Ramsar Convention, the Dongtan project paid little attention to Chongming Island's ecology. There also was only limited attention to social sustainability. In 2005, the Shanghai Chongming Dongtan

Investment and Development Company (SCDIDC) provided four reasons to the Chongming government for launching an eco-city project:[6]

> "To actively advance and protect the wetland ecosystem through landscape ecological engineering interventions into Dongtan's ecosystem;
>
> To create a pleasant amenity and healthy lifestyle through landscape ecological engineering, real estate development, and recreation and tourism businesses;
>
> To found natural capital- and knowledge-based industrial clusters;
>
> To establish a research and education center for ecological sciences."[7]

The first two goals demonstrate a belief that eco-cities can be achieved through a "technological fix"; that novel environmental technologies enable a sustainable ecological system and more sustainable economic development. In many policy speeches after 2006, Dongtan is presented as exemplary of "Ecological Civilization"—a Chinese version of ecological modernization and sustainable development, based on the Brundtland Report but with a particular focus on scientifically constructing human settlements in harmony with nature (e.g., the 2008 First Plenary Session of the 11th Chinese People's Political Consultative Conference).[8] Adopting principles of ecological modernization, the third and the fourth goals reflect the government's intention that

[6] SCDIDC was established by SIIC in collaboration with Shanghai City Government and Chongming County Government to manage the financial investment and real estate development in and around the project site.
[7] Original text is in Mandarin, translated by author.
[8] Available at http://cppcc.people.com.cn/BIG5/34961/120830/120959/7158119.html (accessed on October 1, 2011)

Dongtan Eco-City would create new environmental industries to supplement the island's farming- and fishery-based economy. Throughout, SCDIDC's presentation referred to Chongming's almost uncontaminated environment as "natural capital." At conferences and meetings, many local officials argued that using this natural capital to attract foreign companies to undertake eco-construction would also help an inexperienced Chongming Government improve its financial institutional structure for handling foreign investment. Such views reveal how Dongtan was primarily envisioned as green capitalism, utilizing natural capital for sustainable economic development for both Chongming Island and Shanghai.

Some observers argue that Dongtan's use of nature as economic booster hardly realizes urban sustainability. Herbert Girardet, former consultant on the Dongtan project, describes it as a strategic project to ensure that "China will play a key role in the emergence of a world of ecological and economically sustainable human settlements" and to provide a new urban economy for the island (Girardet, 2006). May Hald (2009) suggests that China's decision to build this eco-city was largely due to its desire to be the first in green urbanism. Hodson and Marvin (2009; 2010) argue that Dongtan (like London's Thames Gateway projects and Masdar City) seeks to create gated ecological enclaves privileging the rich, securing premium spaces for transnational capital reproduction.

Local technocrats and bureaucrats offer a slightly different interpretation. As a traditional agricultural area at the fringe of metropolitan Shanghai, Chongming Island long has experienced outmigration to Shanghai, triggering a local labor shortage that left

many rice fields abandoned. Strict land use regulations in China stipulate that rice fields must be reserved for farming, except when a state-permitted new development project is launched. Dongtan Eco-City thus provided an opportunity to change land use, attract foreign investment to the island, and reduce out-migration. Technocrats and bureaucrats have suggested that economic development is necessary for Chongming Island's economic sustainability:

> "I know sustainable development means environmental protection, but we already have a good environment. We have very good natural conditions here, but everyone wants to leave the island [for Shanghai] … Now, most people staying on the island are elders and children… we need new industries or business to come to the island. We have to attract new investments so that we can have better development, and that is the only thing that can make this island sustainable. Therefore we use the environment we have to attract eco-businesses. Building an eco-city or eco-island is our plan and hope."[9]

> "Sustainable development is for a place that has already developed. For a rural area outside a big city like Chongming, it needs [economic] development before sustainable development."[10]

Here, sustainability has an economic meaning, very different from the Anglophone sustainability concept of balancing population growth and environment. It is a more pragmatic concern for retaining population and seeking "development." Looking retrospectively at the Dongtan development process, a Shanghai government consultant admitted that he believed building an eco-city was ideal because of Chongming's almost

[9] Interview with a local government officer on August 30, 2010 in Mandarin, translated by author.
[10] Interview with a local planning expert on August 17, 2010 in Mandarin, translated by author.

untouched natural landscape: "a huge advantage" that "no other cities at the coastal region have"—a comparative advantage that can be packaged into a distinctive "product" guaranteeing profit amid the fierce competition for urban developmental projects across China's costal regions.[11] Chongming's large swath of unparcelled land, a rarity in the highly developed Shanghai region, makes it practically the only place in the region suited for building the first, and biggest, eco-city in the world. The mindset of "first" and "biggest" is itself an important feature, looked for by the Chinese government when it picks developmental projects to support.

In short, the green development rationale for Dongtan Eco-City was embedded within a complex relationship between environment and economic development, specific to Chongming's desire for development that would restructure its relationship with Shanghai. Notwithstanding uncertainty about whether and how Chongming's environment could materially enhance Dongtan and Shanghai's urban competitiveness, Dongtan was seen as a form of green capitalism, with its natural capital as the only resource enabling Chongming Island's economic development to realize overall sustainability.

Sustainable "suburbanism": solving China's urban-rural tension

Whereas eco-city visions stress higher-density and self-sufficient settlement, some critics argue that the Dongtan Eco-City does not appropriately address existing

[11] Interview with a local planning expert, also a Shanghai Municipal Government Consultant, on August 17, 2010 in Mandarin, translated by author.

social and environmental problems faced by high-density Chinese urban areas. For example, Sigrist (2009: 13) argues that Dongtan Eco-City is a model of "sustainable suburbanism," a replication of the western suburban sprawl creating edge cities on undeveloped land precipitating the decline of central cities. Arup states that Dongtan Eco-City would not be a dormitory or satellite town of Shanghai, but the island's geographical proximity to and economic dependence on Shanghai undermine Arup's ambition of self-sufficiency. Indeed, interviews with local bureaucrats and sustainability scholars suggest that construction of a new suburban town settlement was the original intention behind the Dongtan project.

In its recent history, China has deliberately built small to medium towns in agricultural regions near major cities. Since embarking on socialist central planning in the 1950s, China has intentionally tried to avoid "over-urbanization" and the "mega-cities" found in many Third-World countries. To achieve "industrialization without urbanization," the central planning regime set up Township and Village Enterprises (TVEs) in agricultural regions to retain rural labor and prevent massive rural-urban migration. Zhu et al. (2009: 215) refer to the effects of such policy as "*in situ* urbanization," in which "rural settlements and populations become urban or quasi-urban population without any significant geographical relocation of their residents". Initially, TVEs were only permitted to process agricultural products or directly related services. This restriction was lifted in 1978, when they were encouraged to participate in whatever economic activities were deemed profitable. This accounted for TVEs' increasing success through the 1990s, when their share of national industrial output approached 42% (very

close to that of urban State-owned Enterprises), employing more than 130 million rural workers (about 35% of the rural labor force) (China Statistical Yearbook, 1995, cited in Zhao and Wong, 2002). One result of *in situ* urbanization and the economic policy of TVEs has been termed the "incomplete urbanization" of Chinese cities in terms of their spatial distribution and sizes, with many small towns emerging around major metropolitan areas (Chan, 2010). Chongming Island is where the small towns around Shanghai City are located.

The prosperity of TVEs and associated small town development triggered significant agricultural land losses after the late 1990s, however, affecting grain production and food supply (Zhao and Wong, 2002). The government thus faced the dilemma of either deepening an agricultural crisis, or discontinuing support for TVEs at the cost of undesired migration to major cities. Shanghai municipal government and Chongming county government were seeking possible solutions to this dilemma at the time that Arup proposed building Dongtan with its high-tech green farming and local non-agricultural job opportunities. Many Shanghai local party leaders saw this as a potential solution, a model for small town development in its agricultural regions. One planner of Chongming Eco-Island described the decision to adopt Arup's Dongtan Eco-City approach as more historical accident than intentional action:

> "The Shanghai Government opened the competition for Dongtan's master plan with only one criterion in mind: Shanghai wanted to use the large undivided parcels of undeveloped land on Chongming Island to build something that either had not been seen in other cities or would be the biggest among whatever other cities have… Several international architectural companies

> submitted their designs for competition, with wide coverage of themes like convention centers, hotels, theme parks… After Arup first presented their idea of building an eco-city, the [Communist] Party secretary of Shanghai was convinced that an eco-city would be a good idea as it goes well with the General Secretary of the Party's political guidelines for creating a harmonious society and sustaining agricultural development."[12]

In short, within the specific context of Chinese urbanization and industrialization, Dongtan's unique "suburbanism" is better understood as a strategy to achieve sustainable urbanism by maintaining agriculture and employment opportunities at the urban fringe. In an interview, a local ecological planning expert said that he had been contacted to consult on eco-city projects mostly by local party bureaucrats from secondary or agriculture towns in central China. Whereas the world outside China came to know Dongtan as a model for green settlements in global cities, through Arup's massive publicity and Dongtan's relationship with the London Thames Gateway ecological communities project, in China it is recognized as a model for agricultural towns on the urban fringe.

An island imaginary

As a development on a relatively isolated island, Dongtan/Chingming would seem to fit with western thinking about eco-cities as self-sufficient and sustainable. Thus Portney (2003) argues that many current visions of urban sustainability emphasize containing ecological footprints within a relatively small geographical area. A sustainable

[12] Interview with a local planning expert on August 17, 2010 in Mandarin, translated by author.

city would be one that functions though a close-looped circular use of natural resources, conditioning all human activities inside the city. He mobilizes the visual metaphor of a bubble placed over the city, containing all activities and their impact (Portney, 2003:18). This idea is rooted in the regional planning tradition of "bioregionalism," which suggests that rescaling communities and economies according to the ecological boundaries of a physical region will advance sustainability (Campbell, 1996).

Interviews with local bureaucrats and planners demonstrate that Chongming's island geography was a critical factor in convincing local planners that the Dongtan/Chongming projects were appropriate and realizable, gaining massive support from Chongming county's bureaucrats and Shanghai-based planning professionals.

> "I think an eco-city can be built in Dongtan, but I am not sure if it is replicable. Dongtan itself is special because it has an island ecological system. While other places face both challenges of achieving self-sufficient natural resources circulation and limiting human activities in the ecosystem, Dongtan only has to deal with the latter."[13]

> "I was willing to accept Shanghai municipal government's invitation to conduct the eco-island planning because Chongming is a geographically independent region and free from Shanghai's pollution problems… So my planning could focus on getting the island economically developed, which is my expertise..." [14]

Yet islands also invoke other imaginaries. In China, they are seen as less developed due to their inaccessibility. Indeed, Chongming is one of the least populated

[13] Interview with a local eco-planning expert on August 21, 2010 in Mandarin, translated by author.
[14] Interview with a local planning expert on August 17, 2010 in Mandarin, translated by author.

and industrialized areas in the Shanghai metropolitan region. A one-hour long ferry, southbound to Shanghai or northbound to rural Subei, was Chongming Island's only connection with the outside world, until the Tunnel Bridge connecting Shanghai and Chongming Island opened in 2010 (see Zhou and Shen 2010). Transportation was thus an important constraint on Chongming's economic development; equipment and machinery had to be transported from Shanghai or Subei. As a Chongming bureaucrat put it:

> "I can't think of a better development project than an eco-city or eco-island for Chongming. We don't have resources for developing industries on the island. But we have an unpolluted environment because we are not physically connected to Shanghai. Eco-tourism is the best way to make money out of our geographical limitation."[15]

Thus the widespread support for both projects did not simply stem from their hi-tech green designs and environmentally friendly plans. Chongming Island's physical separation from Shanghai city limited both pollution contamination and the island's industrial development. As noted above, adopting an ecological development path was seen as a means to achieve economic development: legitimizing eco-city and eco-island projects, while capitalizing on the island's natural ecology.

[15] Interview with a local government officer on August 30, 2010 in Mandarin, translated by author.

A cosmopolitan eco-city

Notwithstanding its long history in regional planning since early twentieth century, the bioregionalist view of self-sufficient sustainability has been termed sustainable "new localism" since the 1990s in North America and West Europe. New sustainable localism asserts the efficacy of the local in practicing sustainability: "ordinary people are most likely to pay attention to the physical environment where they see and experience it, and…governance mechanisms in cities or local communities are most likely to be responsive and effective to the environmental concerns of their citizens" (Portney, 2003:16). The importance of the local is stressed within the UN's Agenda 21 and Habitat programs, underwriting many sustainable counter-globalization urban practices prevalent on both sides of the Atlantic that seek to strengthen local communities and production systems.

The conceptualization of community in Dongtan's master plan reveals a very different story: Shanghai Municipal Government and Arup envisioned Dongtan as a cosmopolitan community. At the Planning Institute of Australia National Congress in Perth, Arup's Associate Director Roger Wood framed the social sustainability aspects of Dongtan's masterplan around five goals (Wood, 2007: 7):

> "Create inclusive, cohesive and tolerant communities that recognise traditional and modern Chinese and other cultural values;

> Ensure all citizens can engage with and are represented by governance systems that are accountable and that work towards the continued realization of the fullest concepts of the Eco-City;
>
> Develop a city that enables healthy and safe lifestyles through the provision of key services and facilities accessible to all and which promote health, provide suitable healthcare when required, avoid car dependence and reduce opportunities for crime;
>
> Provide jobs and cultural, leisure, community, sporting and educational facilities for all, regardless of age or ethnicity, and make everyone aware of these opportunities through world class information and communication technology;
>
> Create an internationally, regionally and locally accessible city with user friendly facilities and a sustainable mix of development and housing opportunities blended with green spaces to create vibrant communities and a real sense of place."

While the overall vision of social sustainability relies on various infrastructures and "technological fixes", as discussed above, points a), d) and e) articulate an ambition to form a cosmopolitan and internationalized community in Dongtan. Issues of social equity, highlighted in western sustainability agendas, were not directly addressed. Instead, the emphasis is on creating an attractive residential location for domestic and international elites.[16] This became more obvious toward the end of the presentation (Wood, 2007: 18):

> "Dongtan Eco-City will provide an attractive alternative place for people to live within one of the most dynamic and culturally attractive regions of China and East Asia." (p.18)

[16] Sigrist (2009) and Hald (2009) made the same observation in their research.

My interviews confirmed this cosmopolitan ambition, as part of competing with other regions in China and East Asia. Several interviewees mentioned that Shanghai Municipal Government intended to launch a project that is not only Chinese, but also aligned with Shanghai's desire to be seen as a global city. This makes it easier to understand why Dongtan plotted a Chinese eco-city envisioning "modern living", with western-style low-rise condominiums and high-tech homes, rather than traditional Chinese village life in a village with red brick walls and black-tiled roofs.

Local residents were rather positive about such a westernized urban design. A fisherman, who runs a small vendor business with local restaurants, was asked: "The government is going to build Western style houses to replace your village houses here. How do you feel about it?" Without hesitation, he replied:

> "I like it! I am tired of the backward rural living in Chongming. The new houses the government are building are much more modern…and they say we will have more decent people coming in too… Finally we are going to become as modern and advanced as Shanghai City, and even better, as good as the [United States of] America!" [17]

Dongtan's cosmopolitan design, and local residents' positive reaction to westernized housing, suggest a view of (social) sustainability different from that advocated through sustainable localism. In a western context, facing deindustrialization, business relocation and competition from developing countries, sustainable localism

[17] Interview with a local resident on September 1, 2010 in Mandarin, translated by author.

reflects not only a political tradition of participatory governance, but also an economic strategy to regain local economic independence by disconnecting the local from the shifting spatial division of labor of globalizing capitalism.[18] In contrast, there is a developmental mindset in Chongming that longs for industrialization, values Westernization, and seeks deeper connections to more global capitalist opportunities. Dongtan Eco-City seeks to create a cosmopolitan community based on the belief that it is more "sustainable" than a local agricultural community. Again, the specific local context of Chongming infuses new meanings into urban sustainability, which legitimize it in proponents' minds as a form of green capitalism.

5. Conclusion

In both cases examined here, Dongtan Eco-City and Chongming Eco-Island, a local version of sustainability is overlaid onto Euro-American conceptions of eco-cities, one that is constructed and conditioned on, and shaped by, local desires for economic development, the geographical imagination of an island, and the ambition to make global cities. First, the discourse of urban sustainability is manifested through two linked narratives: natural capital as the only resource enabling development of Chongming Island, and economic development as the only route towards the island's overall sustainability. Second, a local reading of Dongtan traces its origin to the Chinese socio-

[18] Mason and Whitehead (2011)'s recent research on "transition urbanism" demonstrates this localism perspective in urban sustainability.

economic context of *in situ* urbanization. In this context, Dongtan becomes a model sustainability project for agricultural towns in China, even as it is presented as exemplifying a green urbanism for world cities outside China. Third, its island geography provides the spatial foundation for envisioning a self-sufficient sustainability project, but also promoting economic development of an isolated place. Fourth, in contrast to localized framings of sustainability, Dongtan Eco-City was built upon imaginations of being an international, cosmopolitan community. These four characteristics show how economy and ecology become intertwined in the development of Dongtan Eco-City and Chongming Eco-Island, with the ecology of the island envisioned as being incorporable into and internalized within capital accumulation as promised under discourses of green capitalism.

At the time of writing, the Dongtan Eco-City project remains indefinitely suspended. Yet Chongming County Government and Shanghai Municipal Government are working on the Chongming Eco-Island project, projecting, among other goals, that it will become as renowned in the next decade as New York's Long Island, Canada's Prince Edward Island and South Korea's Jeju Island. It is far from clear, however, whether the economy and ecology of Chongming Island will be mutually enhancing, as green capitalism implies.

These findings are suggestive of the broader point that analysts should take into account the contextual factors that shape variegated understandings of "actually existing sustainability." Further research will seek to trace the social networks (local and international) facilitating Dongtan Eco-City construction and the global circulation of its

eco-city design. Although Dongtan is currently considered unsuccessful, it remains influential as a particular model of urban sustainability, traveling through social networks and planning communities. Whereas local processes socially construct variegated eco-city and other urban sustainability practices, following eco-city policy networks can help us understand ways that urban sustainability and green capitalism articulate with one another across space and time. This will involve studying structural mechanisms facilitating convergence and divergence of green urban initiatives, including relatively durable institutional geometries, inter-jurisdictional circulatory networks, and political and economic logics of path-dependency.

CHAPTER THREE

A Green Leap Forward?

Eco-State Restructuring and the Tianjin-Binhai Eco-City Model

According to a survey of the Eco-City Assessment and Best Practices Program, 230 ecological city projects have been planned or are under implementation in China, most starting since the early 2000s. Another 133 low carbon city projects have also emerged since 2008. By March 2011 almost 90% of Chinese local prefectures had undertaken at least one green urban development project (CSUS, 2011). *New York Times* Op-Ed Columnist Thomas Friedman has dubbed these and related initiatives China's "Green Leap Forward" (Friedman, 2010). In this chapter, I seek to interrogate the role of eco-cities in this process. Research examining China's eco-cities is growing rapidly (e.g., Chang and Sheppard, 2013; de Jong et al., 2013; Hult, 2013; Joss and Molella, 2013), but largely as local case studies. I seek to place eco-city case studies within the broader context of China's shifting political economy and environmental governance. The increased emphasis on eco-city and related projects has been associated with a scaling up of eco-city governance in China: from a local responsibility and initiative, to its integration into, and prioritization within, China's Five-Year national plans. "Ecological civilization" has become a national slogan, incentivizing greening initiatives at all scales.

This compels scholarly attention, particularly given China's role, still, as the "workshop of the world" (Wu, 2013).

In this chapter I explore the utility of the concept of eco-state restructuring, developed within the European context (While et al., 2010), in accounting for the changes in China's regulatory and governance regime, both in terms of scalar shifts and economic and environmental priorities and with particular reference to the rise of eco-city initiatives. I suggest that parallels exist between the shifts in environmental governance in Europe and China, even though China is implementing its eco-city projects within a rapidly industrializing economy whereas in the West eco-cities are seen more as a post-industrial phenomenon.

I then discuss China's currently designated best practice eco-city model—the Sino-Singaporean Tianjin Eco-City project in the Binhai New Area (hereafter, Tianjin Eco-City).[19] Placing eco-city initiatives within the context of shifting spatialities, I explore the strategic selectivities in this eco-city model, including the underlying rationalities, as well as the negotiations, conflicts and challenges as they arise on the ground that link to, and also reflect China's transition in political economy. As originally conceived in the west, eco-cities were to be in harmony with the fertile eco-system in which they are situated; China's first, abortive eco-city experiment, Dongtan-Shanghai, followed this model. In contrast, Tianjin Eco-City represents a model designed to

[19] Officially known in English as Sino-Singaporean Tianjin Eco-City, the name used by local residents and officials has been changing. Before 2011, Tianjin Eco-City or Tianjin-Binhai Eco-City was widely used; since 2011, Xong-xing (the literal translation of "Sino-Singaporean" in Mandarin Chinese) eco-city has become more prevalent, enhancing the semiotic significance of its collaborative nature. China's first high profile eco-city, Dongtan, a collaboration with the UK, was never named "Sino-British."

function in inhospitable environments including brownfield sites, making it more broadly applicable, for example in western and northern China. Tianjin Eco-City also marks a reorientation of foreign partnerships, central to major eco-city initiatives in China to date, from European toward Asian collaborations (in this case, Singapore). Notwithstanding significant implementation challenges I observed, Tianjin Eco-City retains its flagship status within national eco-city governance strategies—a testimony to its possible formative role in ongoing eco-state restructuring.

The data and information presented in this chapter are based on on-site field research in fall 2011, follow-up interviews in 2012 and 2013, and document analysis on Chinese eco-city initiatives and Tianjin Eco-City project, including policy documents, technological and planning reports, master plans, academic publications, information brochures, media coverage and online resources. I conducted semi-structured and in-depth interviews with planners, policy makers, developers and scholars involved in the project. Interviews were conducted in Mandarin or English, lasting between 60 to 90 minutes. Information from the interviews was triangulated with on-site observation and archival research. In order to ensure anonymity, interviewees are not listed by name.[20]

1. Eco-state restructuring

Since the 1980s, several influential normative conceptualizations have emerged to describe modes of environmental governance, particularly sustainable development,

[20] I identify interviewees by codes comprising a four-alphabet abbreviation of job affiliation and a randomly assigned two-digit number.

ecological modernization and sustainability. Sustainable development has been criticized for its presumption that economic growth can be ecologically sustainable (Satterthwaite, 1997), and ecological modernization for its optimism about the existence of technological and institutional solutions to the economy/environment tension (Mol and Spaargaren, 2000). Sustainability and sustainable livelihood approaches are much less sanguine about overcoming such tensions, but have received less attention in debates about environmental governance because they tend to prioritize local-scale possibilities (e.g., Sneddon, 2000).

By contrast, eco-state restructuring seeks to theorize how such modes of environmental governance emerge in certain places and times, within the context of shifting state-economy-environment relations under capitalism, reflecting political struggles surrounding competing ecological agendas (cf. Buttel, 2000). From this perspective, the above conceptualizations (sustainable development, sustainability and ecological modernization) tend to underestimate the importance of regulatory transformations in the contemporary state, capitalist or not, and their inter-scalar dynamics (e.g., While et al, 2004; Krueger and Gibbs, 2007). This requires greater attention to state theory.

Building on strategic relational conceptualizations of the capitalist state (Jessop, 2007), While et al. (2010) describe eco-state restructuring (ESR) as follows:

> "ESR…[is] the reorganisation of state powers, capacities, regulations and territorial structures around institutional pathways and strategic projects, which are (at least from the vantage of state interests at a given moment in time) viewed as less

> environmentally damaging than previous trajectories. In this process, the state takes a more active and directed role in regulating the environmental inputs and outputs of mainstream economic and social activities (resource extraction, production and consumption). This includes organising and mobilising strategic interests and actors to undertake specific projects and activities that the state (or certain actors operating in and around the state apparatus) understands to be consistent with strategic environmental goals and outcomes set at international and national levels." (p. 81)

Thus eco-state restructuring places the emergence of particular modes of environmental governance within the larger context of how the state seeks to manage the relationship between the economy, the natural environment, and competing social goals and interests. Environmental governance is conceived as an ongoing process that is infused with power struggles, often riven with conflict and occurring across distinct spatio-temporal registers. Examining western Europe and North America, While and his colleagues identify three distinct "waves" of ESR, each dominated by a particular practice: an emphasis on pollution prevention, control and cleanup from the mid-1960s to the 1980s, sustainable development from the mid-1980s to the mid-2000s, and a politics of carbon control since the late 1990s (particularly since 2005/2006). "Whilst some practices dominate in a particular period, each new wave does not necessarily replace the former but is layered on to it as part of the accretion of functions within the state" (While et al., 2010: 82).

The applicability of ESR in China is subject to question: While and his colleagues acknowledge focusing only on "First World political ecology" (2010: 78). Jessop and

Sum (2006) apply strategic relational state theory to what they call exportist regulatory regimes in Asian newly industrializing countries—capitalist societies where the hand of the state is markedly visible—but they do not discuss China or environmental governance.[21] On the other hand, studies on China's environmental governance since late 1990s also suggest that the birth of various environmental legislations and new management innovations are closely related to China's adaptation of market incentives in environmental management, the urgent request for better living quality from quickly expanding middle class, as well as the economic restructuring towards a consumer society (Mol and Carter, 2007; Mol, 2009; He et al, 2012). Nevertheless, these studies still mainly stay at a relatively descriptive level, whereas the connections between the political economy regime and environmental initiatives are still not well explored. I therefore would like to apply the ESR perspective to China, teasing out how shifting state-economy relations have not only selectively shaped, but also are being reshaped by, China's new environmental initiatives. I use China's urban ecological experiments here as the thrusting point to reveal the interrelations between transitions in political economy and environmental governance. I firstly delineate the transitions of China's regulatory regime, and then situate urban ecological experiments against these transitions to interrogating the state's strategic shifts in China's eco-city development.

[21] Indeed, there are intense debates about whether post-market reform China is, in fact, capitalist (cf. Ong, 2006; Peck and Zhang, 2013). While I do not think it necessary to take a position on this question or its implication for cities (cf. Walker and Buck, 2007), it is important to recognize that shifting state-economy relations have not only selectively shaped, but also are being reshaped by, China's urban ecological experiments.

China's evolving political economy: socialist state, market reform, and economic crisis

Fulong Wu (2010a) has provided a regulation-theoretic account of China's changing territorial political economy, the context within which the ESR perspective can be applied to Chinese environmental policies and eco-city initiatives.[22] He identifies three broad regulatory phases (Wu, 2010a; 2010b): state socialism (1949-1992), market reform and export-oriented industrialization (1992-2007), and the as yet unsettled direction triggered by the global financial crisis (post 2008) (Figure 3.1). Prior to market reform, the Chinese regulatory regime was based on state socialism. At the center of this regime was domestically oriented capital-intensive heavy industrialization, strategically located in cities in the center of the country. Given the limited number of state enterprises, this socialist urban-industrial model did not require a large urban labor force, and levels of urbanization remained below 20% of the population, with urban-rural migration limited through the *Hukou* permit system (see also Huang, 2006).[23] Rural livelihoods were supported through collective agriculture and the Town and Village Enterprise system of rural industrialization. Urban industrial economies were dominated by *Danwei* workgroups intimately linking factories, workers and their residences. Environmental issues were of little importance; the emphasis was on growth irrespective of the consequences.

[22] While regulation theoretic approaches to state-economy relations have been and should be criticized, e.g. for their methodological territorialism, they do have the desirable characteristics of seeking to account for spatio-temporal variegation, and of not being limited in application to purely capitalist economies.
[23] The *Hukou* system is a household-register system officially promulgated since 1958. It controls the movement of people between urban and rural areas by dichotomizing rural vs. urban residents primarily based on their households' location. Chinese citizens only receive social welfare when living and working at the place where their households are located, restricting rural-urban migration.

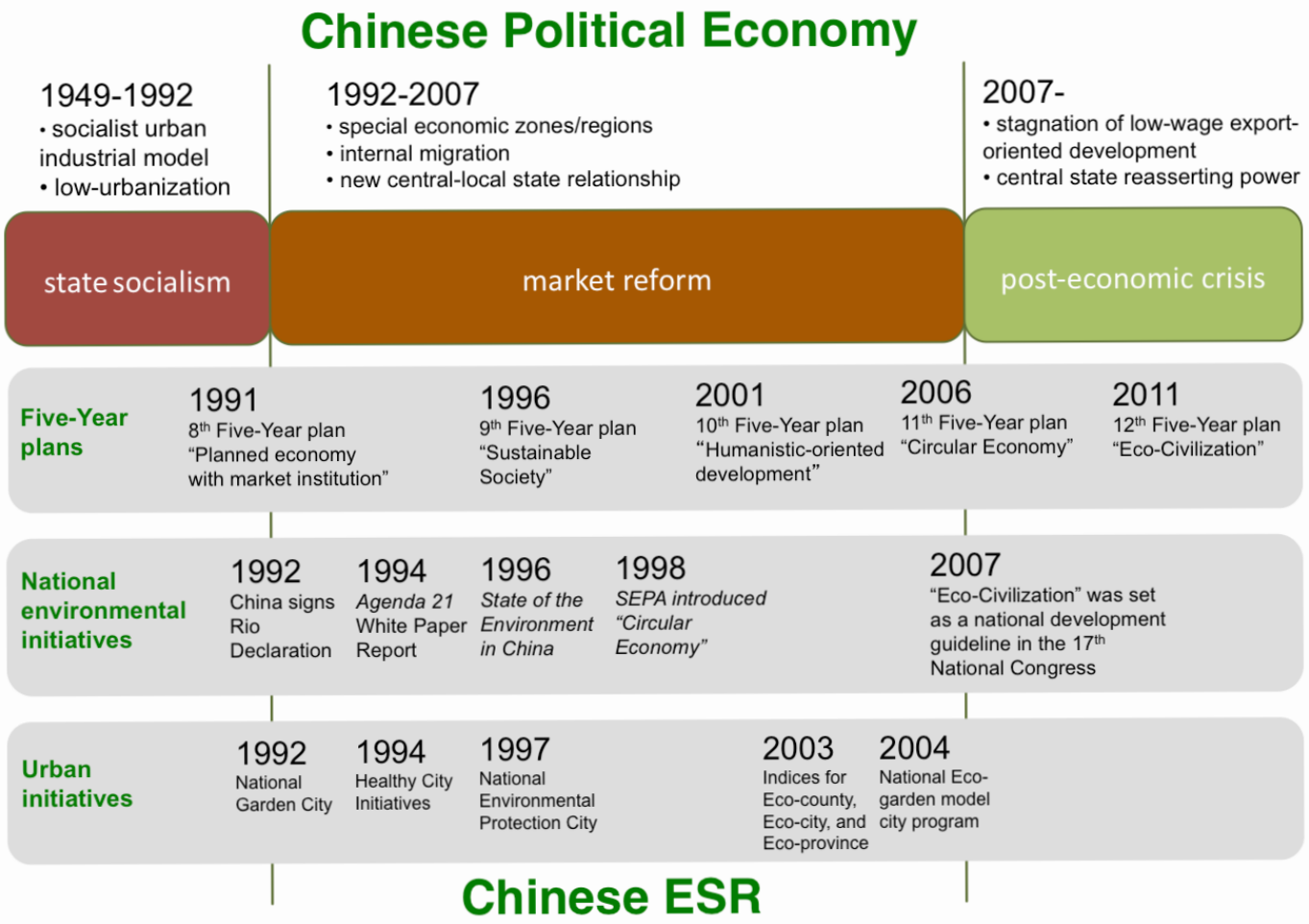


Figure 3.1 Chinese Eco-State Restructuring
(prepared by author)

Market reform after 1992 represented a clear shift in strategic focus by the Chinese state, responding to the dissatisfactions with a previous economic reform initiative of Communist Party leader Deng Xiaoping that culminated in the 1989 Tiananmen Square protests. Deng gave a series of speeches promoting economic reform during his 1992 Shenzhen Tour, catalyzing "being rich is glorious" (*zhì fù guāng róng)* as a wide-spreading Chinese slogan for development in the following years. This shift emphasized low-wage labor-intensive production for export-oriented development, and attracting foreign investors to specially regulated Special Economic Zones (SEZ) located along China's southern and eastern coastal areas. Three regions were targeted as national growth poles for SEZ development: the Pearl River Delta (around Shenzhen), the Yangzi River Delta (around Shanghai's Pudong financial district) and the Bohai Bay Economic Rim (around Tianjin's Economic-Technological Development Area, TEDA, and Free Trade Zone). This mode of regulation relied heavily on massive supplies of labor, minimum wages and the suppression of workers' organizing. Migration was thus encouraged, albeit unofficially. The *Hukou* system remained in place, but the demand for labor triggered massive non-*Hukou* urban-rural and west-east migration, underwriting very rapid urbanization in southeastern and eastern China (Fan, 2005). The Pearl River Delta and Yangzi Delta SEZs boomed, but the northerly Bohai Bay Economic Rim stagnated (cf. Zhou and Ping, 2009).

Importantly, this strategic shift also ushered in novel central-local state relations, requiring and empowering city administrations to engage in local entrepreneurialism to compete for foreign investment. This created novel tensions both between the public and

an emergent quasi-private sector, and between different tiers of the state. Local officials' national recognition and career promotion depended on their performance in achieving urban economic growth, creating great pressure to succeed locally. Yet the central state continued to appropriate the bulk of local revenues (cf. Tsui and Wang, 2004). Indeed, with the 1994 national fiscal reform that introduced "tax sharing (*fēn shuì zhì*)," mandating central state appropriation of local taxes, the central government share of China's total budgetary revenue increased from 22 to 56 percent between 1993 and 1994, staying in this range thereafter (Lin, 2012). The one exception to this centralization provided by the 1994 reform was the declaration that income from land development is not a budgetary item and thus belongs to local governments (Wu, 2013). This triggered a massive boom in local government appropriation of rural land on the urban fringe, for conversion and sale for urban development, also creating a seemingly unlimited potential source of personal wealth for local officials (Hsing, 2006; 2010). George Lin (2012: 20) calls this the "tri-polar relation of state power reshuffling, urban land commodification, and municipal finance."

Wu (2010a) argues that the financial crisis starting in 2007 catalyzed a further strategic shift. Under market reform, the potential contradictions of low-wage industrialization could be exported to Western consumers, eager to purchase the cheap products that low-paid Chinese workers could not afford. These contradictions came home to roost as foreign demand collapsed with the crisis, dramatizing emergent difficulties with low wage export-oriented manufacturing. The supply of migrant workers was already drying up, as a result of expanded social security, labor unrest, and

the slowing of China's 'demographic dividend' (Wu, 2013). Indeed, production was already relocating to even lower wage offshore locations in South and Southeast Asia. With low wage export-based manufacturing regarded as less desirable than promoting domestic demand, the central state's development discourse has shifted to emphasize "humanistic-oriented development" (*yǐ rén wéi běn*) and "development with a scientific outlook" (*kē xué fā zhǎn guān*), including a significant focus on environmental governance. Major state-led initiatives include: enhancing the social safety net (e.g., minimum living standards and free rural education); making large-scale neo-Keynesian infrastructure investments (four trillion RMB, with 360 million dedicated to environmental initiatives, including eco-cities); reasserting the role of state-owned enterprises (SOEs)[24] in profitable and monopolistic economic sectors (railways, roads, petrochemicals, aviation); capital- and technology-intensive investment (particularly green and information technologies); and adopting policies allowing domestic incomes to increase and stimulating urbanization. At the same time, Wu argues, the central state is reasserting its power and influence, including over environmental governance.

China's eco-state restructuring and urban environmental experiments

Deng's 1992 call for economic development initially prompted a surge of public and private sector growth-first projects with little concern for environmental impact, as in

[24] SOEs received much of these four trillion yuan and are investing their surplus in real estate, making them important actors in China's local land-driven economy. Hsing (2006) provides a vivid description of the relationships connecting local officials, planners, and SOEs developers.

the pre-reform phase. Yet the Chinese government had also signed the 1992 Rio Declaration, publishing its environmental guidelines in 1994: *Agenda 21 White Paper on China's Population, Environment and Development in the Twenty First Century*. Its 1996 annual report *State of the Environment in China* 1996 (published in 1997) noted that environmental pollution and ecological destruction were rapidly intensifying in urban areas, but also in the countryside with the growth of Town and Village Enterprises. Indeed, concerns for sustainable development played an increasingly central role in national policies since late 1990s, including influential environmental legislation for Cleaner Production (*qīng jié shēng chǎn*) and Total Pollutant Emission Control (*wū rǎn wù pái fàng zǒng liàng kòng zhì*).

The articulation of environmental concerns with rapid urbanization after market reform also triggered a series of state-led urban environment-related initiatives, including the 1992 National Garden City (*guó jiā yuán lín chéng shì*) and 1994 Healthy City (*jiàn kāng chéng shì*) initiatives, to tackle polluted, overcrowded urban environments and the "social disorder" associated with rapid industrialization in urban regions. The late 1990s saw earlier urban initiatives aimed at creating modern socialist cities (e.g., the 1980 National Civilized City (*quán guó wén míng chéng shì*), and 1990 National Hygienic City (*quán guó wèi shēng chéng shì*)) also retrofitted with new requirements regarding the urban environmental quality of life. Responding to negative publicity about pollution, urban environmental quality became a criterion for most model city selections, one that had to be squared with the Chinese state's desire to continue its rapid economic growth. Thus a priority of the central state has become creating model cities that simultaneously

exhibit rapid economic growth and a clean and healthy environment: the sustainable development paradigm. Expected to compete for such designations, local state officials faced new responsibilities and expectations.

Beginning with the 9th Five-Year Plan (1996-2000) and associated long range planning document, *Social Development and Long-Range Objectives to the Year 2010*, concerns for urban environmental protection and ecological systems were further integrated into China's national planning process. The goal of national development, explicitly restated in each subsequent Five-Year Plan, became restructuring China into a sustainable, matured consumer society with a resource efficient industrial economy and eco-friendly urbanization. With the 11th Five-Year Plan (2006-2010), the circular economy—a German/Swedish paradigm of industrial ecology[25] involving the closed-loop circulation of energy, materials and waste and the "three Rs" (reduction, reuse, recycling)—became the means to transition toward a resource efficient industrial economy and eco-friendly urbanization.[26] Chinese policy makers envisioned the circular economy as simultaneously resolving the challenges of clean production and clean consumption (Yuan et al., 2006; Geng and Doberstein, 2008). On the production side, ecological industrial parks were proposed as a key strategy for implementing the 3Rs: Updating existing industrial standard operating procedures and equipment (improving pollution control built-ins), while reducing resource consumption and making industrial

[25] I recognize that there are various debates on the origin of circular economy; but here I follow the Chinese discourse that widely suggests China's circular economy agenda is related to ecological industry ideas from Germany and Sweden (see, Yuan et al., 2006).
[26] The circular economy was initially proposed by the State Environmental Protection Administration in 1998.

production more resource efficient with an increasing focus on technological solutions (Yuan et al., 2006; Geng and Doberstein, 2008), analogous to ecological modernization. In 2004, the work of promoting and implementing a circular economy was taken over by the State Council committee in charge of national economic and social development plans, the National Development and Reform Commission, signaling the centralization of this agenda as a national priority.

On the consumption-side of the circular economy, eco-cities were proposed as a policy tool to address both existing urban environmental issues and demands for further urban growth (XIE et al., 2010). Their construction is mainly guided by two policy frameworks: a) the *National Eco-Garden Model City* (*guó jiā shēng tài yuán lín chéng shì*) initiative, administered by the Ministry of Housing and Urban-Rural Development), a 2004 revision of the earlier Garden City initiatives; and b) the *Indices Framework of Ecological County, City and Province* (*shēng tài xiàn shēng tài shì shēng tài shěng jiàn shè zhǐ biāo*), administered by the Ministry of Environmental Protection, a 2003 revision of the National Environment Protection Model City initiative. These revisions sought to shift the emphasis from urban quality of life and green space to public infrastructure provision aimed at reducing pollution and enhancing environmental health (e.g. mass transit and water treatment facilities), seeking to reduce resource consumption and create cities that operate as ecological systems. Both policy frameworks gained State Council support in the mid-2000s, making eco-cities a state-endorsed urban development model of the highest priority. The central government has also encouraged inter-referencing of

eco-city indicators between the two policy frameworks.[27] Recent eco-city projects have attempted to fit themselves into both policy frameworks (Tianjin Eco-City even tries to synthesize both by tightening construction requirements and creating a new set of eco-city standards, see below). Such state endorsement also signals a centralization of environmental governance from the local scale back to State Council and central party commissions, much like the centralization Wu and Lin note more generally for urban governance particularly after 2007. Such upscaling of eco-city initiatives may be seen as strategically selective, reasserting the power of the national government over environmental governance.

The circular economy and eco-cities have also been associated with sustainable development "with a scientific outlook," a new national goal focusing on scientifically innovative and ecologically sustainable development. This kind of sustainable development should feature "a harmonious socialist society with democracy, law, equity, justice, honesty, vitality, social stability, and harmony between man and nature," combining social justice with ecological sustainability (Hu Jintao 17th National Congress speech, October 25, 2007).[28] Thus eco-cities now signal the Chinese Communist Party's goal of creating a new era in which China will supposedly "leapfrog" western post-industrial capitalist states by providing an ecological lifestyle with cutting-edge green technologies for all. Articulated with China's socialist modernization campaign dating

[27] Interview with TJEC01 in September 2011 and November 2012.
[28] Available at http://cpc.people.com.cn/GB/64162/64168/106155/106156/6430009.html

back to the 1980s, this ecological leapfrog thinking has been framed by the new slogan of "Eco-Civilization," appearing in 2011 in the 12th Five-Year Plan.[29]

Tracking changes in China's environmental governance, I observed parallels between the "waves" of ESR in the West and in China (Figure 3.1). Pollution control regulations were first proposed after the 1992 market reform. Governance of the urban quality of life was prioritized to mitigate the severe environmental degradation resulting from rapid industrialization and urbanization. In the late 1990s and the early 2000s, sustainable development became the prevailing policy paradigm. But during this period, regulatory frameworks were scattered across various model city programs, to be implemented at the local level, coinciding with the devolution of Chinese urban economic governance that reinforced local entrepreneurialism. The most recent "wave," starting in the mid 2000s and exemplified through current Chinese eco-city thinking, shifts environmental governance towards a strong concern for local ecological self-sufficiency, emphasizing eco-urbanization experiments that centering around low or zero carbon territorial policies.

Main characteristics of Chinese eco-cities

Building on the initiatives of the *National Eco-Garden Model City* and *Indices Framework of Ecological County, City and Province*, eco-cities start to prevail in local development landscape since mid-2000s. There are several notable features associated

[29] For details of Eco-Civilization, see http://www.mep.gov.cn/ztbd/rdzl/stwm/

with eco-cities. First is international partnership: Local states seeking to implement eco-cities, in entrepreneurial competition with one another, have signed agreements with foreign partners—initially European and more recently Asian—to both draw on their expertise with green urbanism and raise external capital. The capital-intensive nature of eco-cities requires initial investments that exceed the financial capacity of most Chinese cities (Wu, 2012). Presumably such partnerships also have to be endorsed by Beijing, but the level of state involvement may vary. Partnership also draws in foreign investment that is environmentally constructive rather than destructive. Environmentally constructive foreign investment would increase local government's green GDP, which has been proposed to be the new evaluation methods on local cadre's performance to replace traditional evaluation only emphasizing economic growth (Economy, 2007). Local leaders also equate the title of being an eco-city with their ability to bring in investment, host international events, and act progressively in urban policies, similar to the influence brought by earlier National Environment Protection Model City (Rock, 2002; Economy, 2007).

As a reflection of local governments' entrepreneurial competition, Chinese eco-cities were initially conceived as greenfield projects, emphasizing new infrastructures expanding the urban economy by functionally incorporating exurban fringes and isolated rural economies into existing urban systems (see also Xie et al, 2010; May, 2011). On the one hand, local government officials saw this as ideal for accommodating (as well as promoting) further urbanization on the urban fringe, while sustaining local (also national)

economic growth.[30] On the other hand, greenfield eco-city projects contribute to the "land economy" based on commodifying land at urban fringe and municipal finance for construction projects, the major economic activity for Chinese local states after market reform (as described by Hsing and Lin). Earlier eco-initiatives, particularly the Dongtan Eco-City project (Chang and Sheppard, 2013), exemplified this model.

But eco-city developments since late 2000s increasingly focus more on grayfield and brownfield. Dongtan's suspension in 2008 together with the failure of another United Nations sponsored small-scale experiment, Hungbaiyu, marked a shift in thinking. Eco-city initiatives, by requiring green construction technologies and using circular economy principles, came to be seen as a model for upgrading outdated physical infrastructure in already urbanized regions and guiding urban consumption patterns towards a more efficient and environmentally-friendly path (Qiu, 2009). Such a model, making eco-cities less dependent on localities with productive ecosystems, would be potentially replicable across China's less fertile northern and western provinces. Grayfield and brownfield projects also avoid converting arable land at urban fringe that has been identified as a major cause of both environment deterioration and social unrests, challenging China's governance legitimacy after late 1990s (Mol and Carter, 2007; Chen, 2001). Eco-city projects since late 2000s also emphases social welfare provision, including housing, education, and health care, as the reification of "Eco-Civilization." Tianjin is the current flagship project that exemplifies this model. Table 3.1 lists the major differences of the Dongtan and Tianjin models.

[30] Most interviewees mentioned they think the most important goal of building eco-cities in rural areas is to prepare for projected further rapid urbanization.

	Shanghai-Dongtan	Tianjin-Binhai
Collaboration type	Private-public	Public-public
Main foreign partner	Arup, UK	National government, Singapore
Regional focus	Southeastern	Northern and Western
Development type	Greenfield	Grayfield and brownfield
Planning paradigm	Symbiotic with local eco-system	Engineering artificial eco-system
Planning vision	Innovative and visionary	Practical and replicable
Economic feasible plan	Attracting foreign investment	Aiming at economic self-sufficiency
Targeted population	National and international elites; featuring high-tech luxury condos.	Residents at all income level; featuring public housing.

Table 3.1 Differences between Shanghai-Dongtan and Tianjin-Binhai Eco-Cities

For the following, I focus on the paradigm shift of eco-city model from Shanghai-Dongtan Eco-City to Tianjin Eco-City, with particular attention to the latter as it represent the most prestigious eco-city planning in China at the time of writing. I read the shift in eco-city planning paradigm through the planning details, policymaking and implementation process, as well as the governmentality behind these, articulating which to the transitions in China's political economy. Through the ESR perspective, I argue that it is important to recognize shifting state-economy relations have not only selectively shaped, but also are being reshaped by, China's urban ecological experiments. With the

eco-cities as the case studies, I also contribute to exploring ESR's implication in local states and their urban ecological experiments, by whom and on what rationales those experiments are enabled, through which governance mode and to what strategic ends.

2. From Shanghai-Dongtan to Tianjin-Binhai: constructing a best practice eco-city

With the eco-city trumping other urban environmental governance approaches, becoming the next construction fever after the special economic zones and global cities of the 1990s, the Chinese central government has been in search for a model eco-city. As for Chinese urban policy more generally, city governments would then be encouraged to emulate this best practice model in order to meet stipulated environmental targets, thereby replicating the model nationwide (Hoffmann, 2011; Zhang , 2012). The 2003 *Indices Framework for Ecological County, City and Province*, and the *National Eco-Garden Model City* initiative of 2004 laid out such targets, triggering a dramatic increase in eco-city projects (CSUS, 2011). Most of these involve collaboration with foreign partners to leverage their experience with green and sustainable development, the majority being prestigious architecture and construction companies or governments from North America, Western Europe, and most recently, Singapore.

Dongtan Eco-City on Chongming Island, on the edge of Shanghai, was the first national experiment: a Sino-British collaborative project for which planning and implementation began in 2005. It was primarily designed by Arup, a London-based transnational engineering and design firm, with support from the British central

government, the Chinese Central and the Shanghai governments through the Shanghai Industrial Investment Company (a Shanghai municipal government public-private pharmaceutical and real estate company listed on Hong Kong's stock exchange). The design of this project shows great similarity with the original conception of eco-cities as developed by Richard Register (1987, 2002), one of the founding figures of the concept. Register conceived eco-cities as making good on the principle that human settlements can be ecologically sustainable and livable. They should be designed from scratch to be compact, supportive of urban life, fitting the bioregion and healing the biosphere: reducing energy consumption, promoting community, health and social equity, prioritizing non-motorized transport, and contributing to the economy (Register, 2002: 174-176). In this spirit, Dongtan represented an integrated sustainable urbanism approach to urban planning that simultaneously addresses multiple issues in one master plan, incorporating human life and the natural environment into a self-sustaining system. Dongtan's master plan was closely connected to its wetland eco-system, with designs such as low-rise and low-density residential development to accommodate the wetland's specific geological conditions and carrying capacity, and various innovative and pioneering environmental technologies to realize a carbon-neutral city.[31]

The project was officially suspended in 2008, however, prior to implementation. A variety of factors explaining this suspension have been identified. One was the waning political influence of Shanghai's former mayor, Chen Liangyu, convicted of corruption

[31] For Dongtan's planning details, see SIIC (2006).

that year.[32] But there also was significant criticism of Dongtan's location on urban conservation wetland, its marketing strategy aiming at wealthy elites, and the absence at that time of a land transportation link with Shanghai. As the first large-scale eco-city experiment, Dongtan's master plan was characterized by some as a "brainstorming exercise" that did not carefully consider its financial feasibility (Wu, 2012). Ex-post, however, Dongtan's location on an environmentally sensitive wetland stifled the project's survival (Qiu, 2011), which in turn undermined the replicability of its master plan.

This last criticism of Dongtan helped underwrite the ascendance of Tianjin-Binhai as the next Chinese eco-city model. In 2007, Chinese Premier Wen Jiabao signed an agreement with Singapore's Prime Minister Lee Hsien Loong (*Framework Agreement on the Development of an Eco-city in the PRC*, 2007) for jointly developing a flagship eco-city. Four cities were proposed as potential project sites: Tianjin-Binhai, Tongshan, Baotou and Urumqi, all industrial cities located in northern and western China and lacking sufficient water resources (Figure 3.2). These features reflect two common urban governance challenges in China that eco-cities were supposed to redress: the need to upgrade low-tech, heavily-polluted and labor-intensive manufacturing-based urban economies, and water supply shortages (Li, 2011).

[32] For related news report, see http://www.nytimes.com/2010/06/25/business/energy-environment/25iht-rbogdong.html

Figure 3.2 Four Candidate Cities

With respect to upgrading, after decades of striving to become manufacturing powerhouses during the socialist era, with market reform Chinese cities faced great pressure to expand their service sector. This pressure intensified after the 1994 fiscal reform forced local governments to at least partially shoulder funding for their development projects (Wu, 2010b; Lin, 2012). Affluent southern coastal cities, linked with successful SEZs, successfully achieved relative financial independence, but northern and western cities continue to struggle, often heavily dependent on less profitable and outdated mining and heavy industries (Liu, 2009). Further, the lack of an efficient water management system has become an urgent constraint on Chinese urban development. In

China's Water Crisis, Ma Jun argued that 400 out of China's 600 cities face varying degrees of water shortage, including 30 of the 32 largest (Ma and Li, 2006; see also Liu and Dimond, 2008). Even in southern cities with better water supply, urban and industrial pollution generates severe clean water shortages.

The Tianjin Eco-City model offers the promise of upgrading to a more efficient and green economy (introducing new industrial standard operating procedures and equipments), developing less polluting industries with greater value added (e.g. information, communications and environmental technologies), while expanding their service sector. It is also supposed to operate as a closed circular system to achieve self-sufficient energy and resource supply, including water. A model eco-city would be equipped with a new water management system, focusing on clean tap water supply, water recycling, water treatment and reclamation facilities. In order to achieve such objectives, the central government has developed three broad criteria for the best practice eco-city model: practicability, adopting affordable and commercially viable technologies; replicability, applicable across China and in other countries; and scalability, adaptable for eco-city projects of varying sizes (SSTECAC, 2009).[33]

For much of the period since 1992, modern Western capitalist cities were the most popular imaginaries and models for various urban development projects (Huang, 2006). Thus Shanghai's Pudong district imitates Manhattan in New York City, and satellite towns in Shanghai's suburbs strive to replicate European cities. In the past decade, however, Asian cities, such as Singapore, Hong Kong, Taipei, Seoul and Tokyo,

[33] See also Singaporean Tianjin Eco-City official website at http://www.tianjinecocity.gov.sg/bg_intro.htm

increasingly have become models for Chinese cities to emulate. The changing foreign partnership arrangements of Chinese eco-city projects shows a similar transition, supplementing the European partnerships from the early 2000s with Asian partnerships in the late 2000s; Chinese eco-city models increasingly are adopting urban planning codes and designs originating in Singapore and Japan (particularly Kitakyushu).[34]

Interviews with Chinese planners identified several factors influencing the initial decision to collaborate with Singapore on developing an eco-city model: a previously well-received successful collaboration with Singapore, political and cultural affinities, and high-level political and financial endorsement. In 1994, China and Singapore began collaboration on the China-Singapore Suzhou Industrial Park (CSSIP). By the 2000s, CSSIP was presented as an internationally competitive high-tech eco-industrial park, with a modern, ecologically-friendly township in the image of Singapore (Wei et al., 2009). This model circulated widely among Chinese cities.[35]

The affinities between and familiarity with one another's governance systems were of particular importance to the collaboration with Singapore. From the perspective of China's national government, Singapore represents a "capitalist version of the communist dream" (Cartier, 1995; Wei et al., 2009). Hsing (2006) argues that Singapore and China's cultural and political affinities underlie Singapore's extensive foreign direct

[34] The transition to Asian partnerships has been evident in recent urban sustainability related political events. For example, in March 2013, upon the invitation from Singaporean government, China mandated top cadres (two from each province's Development and Reform Commissions) to visit Singapore to learn eco-city and sustainable urban planning (interview with SGLC02, March 2013). Meanwhile, China continues to host the annual International Eco-city Forum in Tianjin Eco-City, in order to demonstrate a replicable model based on the success of an eco-city with Chinese characteristics through the collaboration with Singaporean Government. However, while more Chinese cities incline toward Asian partnership, other eco-cities still collaborate with European and North American partners.

[35] Interviews with TJEC01 in September 2011; BJPR10 in October 2011; TJNU11 in October 2011.

investments since the 1990s in China's industries and urban land markets. In an interview, a Chinese urban planner, collaborating with a European partner at the time on a small-scale local eco-city master plan, spoke of "profound differences" between European and Chinese partners, in comparison to working with Singaporean planners earlier in his career. In his view, Singaporeans are much more adept at securing support for the master plan from local leaders. He described Singaporeans as appreciating the importance of "being flexible in green designs to cater to the preference of each *Yibashou* in various local government sectors for acquiring approval."[36] Even though the national government has warned local officials against copying foreign models (Hughes, 2006), according to a top planner of Tianjin Eco-City: "We are not just copying a foreign model this time, we are bringing in an advanced eco-city model from an advanced Chinese society."[37]

Beyond the belief that a government partner is more reliable than foreign private companies, collaboration with Singapore was appealing to Chinese politicians and planners because of the Singaporean government's promised financial investment and institutional support. Whereas public-private collaborations with North American and European partners entailed limited financial investment on their part, the Singaporean government would shoulder half of the construction costs, also offering substantial support from its Ministry of National Development and other state agencies (also see, de Jong et al, 2013: 108). A leading Singapore planner and early participant in planning

[36] Interview with SHUP05 in October 2011. Y*ibashou* are the de facto senior leaders with absolute power in Chinese public or private organizations. They mostly are party members with good political connections.
[37] Interview with TJEC03 in September 2011.

Tianjin Eco-City stated: "At a time when many private [investment] projects have failed across Chinese cities, work[ing] with Singapore can make sure [that] the eco-city is a risk-free investment and will certainly be built on time."[38] Public-public collaborations are also believed to be less subverted to real estate speculations, and can be more attentive to social sustainability in eco-city development.[39]

In October 2007, China and Singapore proceeded together to the process of site selection, with Tianjin-Binhai officially announced as the chosen site on November 18th. Two principal reasons for this choice were offered in the press and the interviews. First, the project site in Tianjin was located inside the Tianjin Binhai New Area (previously TEDA and the Tianjin Free Trade Zone), which encompasses Tianjin Port and had been designated as the main Special Economic Zone (SEZ) for Northern China, along with Shenzhen in the South and Shanghai's Pudong. Location inside the SEZ entailed better basic infrastructure and also resembles the setting of the previously successful CSSIP, a condition perceived as conducive to the eco-city's success.[40] Second, its proximity to Beijing (150 kilometers away) and Tianjin (a metro area of 10 million people, 40 kilometers away) offered a more accessible site (Figure 3.3) with greater prospects for commercial viability and long-term economic sustainability.

[38] Interview with SGSB01 in March 2013.
[39] Interview with TJEC02 in September 2011, SGSB01 in March 2013.
[40] Interviews with TJEC03 and TJEC06 in September 2011; also see http://www.tianjinecocity.gov.sg/bg_intro.htm

Figure 3.3 Location of Sino-Singaporean Tianjin Eco-City
(Source: Sino-Singaporean Tianjin Eco-City Administrative Committee, http://www.eco-city.gov.cn/eco/html/zjstc/ztgh.html)

The Singaporean side, in particular, preferred this location for its residential housing market potential.[41] Wu Tsai Wen, the first CEO of the Sino-Singapore Tianjin Eco-City Investment and Development Co., Ltd.[42] publicly stated that the aim of Tianjin Eco-City is to create a residential city with marketable housing prices in various venues.

> "We are realistic. We are not going to demonstrate an eco-city with the most state-of-the-art environmental technologies, zero carbon emission and zero waste, where people need to spend a lot of money to move in, only after twenty years…. We are going to make cities that normal Chinese people with average income can buy and move into within three to five years." (Wang, 2009)[43]

The emergence of Tianjin as the new best practice eco-city model is associated with two aspects of state restructuring: A greater stake and involvement of the central state in framing thinking and developing a regulatory framework for eco-cities, combined with a Beijing initiated inter-state cooperation with Singapore, extending state restructuring beyond the national territory.

3. Planning and implementing Tianjin Eco-City

After three working meetings in early 2008, China and Singapore planners finalized the master plan, initiating implementation of Tianjin Eco-City on September 28.

[41] Interviews with TJEC03, TJEC05 and TJEC06 in September 2011.
[42] The joint investment company of China and Singapore specifically created for Tianjin Eco-City development.
[43] Original text in Mandarin, translated by auther.

The master plan was jointly designed by the China Academy of Urban Planning and Design, the Tianjin Urban Planning and Design Institute, and the Singapore planning team (led by its Urban Redevelopment Authority). The project site in Tianjin-Binhai is largely non-arable wasteland, where no complicated legal procedures are required for development[44]; only 2,157 people in three villages were relocated according to Tianjin Eco-City's unpublished 2009 relocation plan (also see World Bank, 2009:14); from a Chinese planning perspective, it is considered a microscopic number with controllable contestations against relocation.[45]

Tianjin Eco-City is envisaged to house 350,000 permanent and 60,000 temporary residents on 34.2km^2, a medium size city by Chinese standards. The priority of the master plan is to create "a thriving city which is socially harmonious, environmentally-friendly and resource-efficient – a model for sustainable development."[46] The eco-city plan envisions infrastructure that can power the city mostly on clean and renewable energy, lowering carbon emissions. Since coal consumption has resulted in serious pollution, Tianjin Eco-City proposes wind turbines and solar panels to supply renewable energy for up to 20% of total city's consumption, with the remaining 80% coming two combined heat and power plants using clean coal outside the eco-city. The eco-city also features green transportation, including rail transit, slow mobility systems (pedestrian and bikes),

[44] Building eco-cities in green fields encounters two challenges: loss of valuable farmland and relocation of large numbers of pre-existing residents, both of which can create considerable political obstacles. Indeed, preserving farmland for the production of food is a priority in national land use regulations; to convert farmland at the urban fringe involves complex legal procedures with the Ministry of Land and Resources, which constituted an obstacle that Dongtan faced (Wu, 2012).
[45] Interview with TJEC05 in September 2011.
[46] See details at Singaporean Tianjin Eco-City official website at http://www.tianjinecocity.gov.sg/bg_intro.htm

separation between pedestrian and vehicular traffic, and electric cars (a joint technological innovation with General Motors).

The Chinese national government also aspires to make the eco-city into a green oasis on local dry and alkaline wasteland through a water recycling and reclamation system, and geological engineering and ecological restoration. By 2020, at least 50% of the Tianjin Eco-City's water consumption should come from non-conventional sources, including collected precipitation, distilled seawater and reclaimed wastewater. Meanwhile, imported fertile and clean soil is replacing the alkaline and polluted soil, polluted ponds are being cleaned up, and vegetation is planted to create a wetland and river eco-system that is expected to be a bird habitat. As proclaimed in its master plan, Tianjin Eco-City will be "an integrated eco-system comprising 'reservoir-river-wetland-greenery'" (SSTECAC, 2009: 10)

Tianjin Eco-City also emphasizes economic development. It plans to specialize in service industries, and become an educational and R&D center for environment-related technologies. It is currently attracting investment from software, animation and pharmaceutical industries, and aims to expand tourism and education related services. Housing developments are another focus. Through its partnership with Singapore, the Chinese government is replicating Singaporean housing development practices, including introducing Singaporean mixed-income high-rise public housing blocks. In Tianjin Eco-City, these blocks, called "eco-cells," each occupy an area of 400 by 400 meters, with four to five 20-30 story high-rise residential towers and shared basic infrastructures, schools and businesses. Four eco-cells make up an "eco-community"; several eco-

communities come together to form an “eco-district” with a business center (Figure 3.4). Tianjin Eco-City will consist of four eco-districts, with an eco-island for recreation in the center, all linked by transportation corridors (SSTECAC, 2009). All construction is to be certified by state-of-the-art global green building codes. Currently 20% of the housing is planned to be affordable social housing, and all the residents will receive free 12-year education, free transportation inside the eco-city, and discounted rate in medical care. Tianjin Eco-City is the first city in China providing these benefits.

Figure 3.4 Eco-Cell, Eco-Community and Eco-District

The project is planned in three phases between 2008 and 2020. Phase one was scheduled for implementation between 2008 and 2010, and would cover a start-up area of $4km^2$ housing a population of 85,000. Phase two is planned to be implemented between 2011 and 2015, completing the basic physical layout of the eco-city, including major infrastructure, public facilities, and a transport network linking it with Tianjin Binhai New Area and surrounding regions. Phase three, from 2016 to 2020, will focus on developing the north and northeast districts for mixed use of residential housing, businesses and industries (SSTECAC, 2009; World Bank, 2009). It is expected that the eco-city will be fully developed by 2020. By the end of 2011, construction of the $4km^2$ Phase I start-up area was complete, and a Chinese animation and filming company had moved in from Shenzhen.

A "ghost town" as exemplar [47]

To date Tianjin Eco-City has failed to meet projected population goals, with not a single resident having moved into its newly built apartments as of October 2011. During 2012, the eco-city's governing body, Sino-Singapore Tianjin Eco-City Administrative Committee (SSTECAC), promoted its residential projects widely in the Chinese media.[48] Some housing units have been purchased by Chinese households, as investment property,

[47] In the Western context, a ghost town generally refers to a city that was abandoned after economic decline or human/natural disasters. In China, however, a ghost town refers to newly built urban areas where no residents move in. Ghost towns have become a common phenomenon under China's local construction fever in the recent decade. See, for example, Time magazine's detailed coverage of Kangbashi city in Ordo, China. (http://www.time.com/time/magazine/article/0,9171,1975336,00.html).

[48] For example, see http://tj.house.sina.com.cn/news/2012-12-04/1419174039.shtml

but most remain unoccupied as of late 2013. Nevertheless, Tianjin Eco-City retains a very high level of support from the national government, as China's flagship eco-city. Its design formed the basis for a guide to eco-city construction models and indices, published by SSTECAC as a basis for other Chinese eco-cities to emulate (SSTECAC and Bluepath City Consulting, 2010). Since 2011, SSTECAC has been working with the Ministry of Housing and Urban-Rural Development to develop indices and measures for evaluating other Chinese eco-city projects.[49]

Secondary sources and expert interviews suggest that the central government's ongoing promotion of the Tianjin Eco-City model as a successful exemplar reflect its potential to redress major problems facing Chinese urbanization patterns and processes. Tianjin Eco-City exemplifies a solution for using environmentally disadvantaged and degraded land productively and sustainably. Unlike the inherited "natural capital" available at Dongtan, one-third of the Tianjin Eco-City project site is on alkaline non-arable land, one-third on a deserted saltpan, and the final third on polluted water bodies (SSTECAC, 2009). According to the deputy director of SSTECAC this makes it a perfect site for experimentation: "If we are able to make Tianjin Eco-City work, it means we can create valuable urban space from nothing."[50]

In the 4 km^2 start-up area of Tianjin Eco-City, "naturalness" is being artificially created through green technologies. Through ecological engineering, man-made material flows and circulation systems, and landscaping with non-native plant species, everything "natural" in the city is artificial or imported, erasing the indigenous coastal arid eco-

[49] Interview with TJEC01 in September 2011 and November 2012.
[50] Interview in September 2011.

system in the project site from the urban master plan. What takes over is a green urban space, with trees and grass around an artificial river and lake – a desirable eco-system for human settlement that is far from indigenous to the area. Green technologies free this type of ecological urbanization from place-specific eco-systems. In this vision, the eco-city's eco-system can be standardized, making replication possible elsewhere. As one eco-city planner commented: "Upon completion of this eco-city, we can use the experience to build cities in places like some abandoned towns in central and western China in the future." He continued: "People will no longer have to move to the big cities for better quality of life, [because] they can have their own eco-city at home."[51]

Refashioning the model

Local political leaders acknowledge that Tianjin Eco-City is unlikely to reach the projected population goals, unless sufficient employment opportunities are created at the project site and in the nearby TEDA.[52] Yet Tianjin Eco-City aims to be economically sustainable, expecting all construction expenses to be covered by real estate revenues. This is unrealistic since the cost of adopting green technologies is still considerably higher than revenues from new real estate developments.[53] This has compelled SSTECAC to change its social planning goals: decreasing the portion of public housing provision, even though public housing is an important feature where Singapore has

[51] Interview with TJEC02 in September 2011.
[52] Unofficial conversation with two local government officials in October 2011.
[53] Interviews with TJEC03 in September 2011.

expertise. According to Tianjin Eco-City planners, originally 50 percent of the total housing units were planned as affordable. Under the pressure of high construction costs, however, this proportion was reduced to just 20 percent.[54] While similar to that of other major Chinese cities, this proportion is lower than in Tianjin City (30 percent), and significantly lower than in cities where the traditional socialist *Danwei* structure is responsible for the supply of affordable housing.[55] From the perspective of housing affordability, this model eco-city is less socially sustainable than the Chinese socialist city.

Rather than itself underwriting the costs of undertaking development, SSTECAC now sells small parcels of land in the eco-city's residential area to real estate companies at below market prices.[56] Real estate companies are encouraged to maximize profits from their property, as long as construction follows green building codes. This has resulted in the majority of the housing units targeted at households with above average income; the original open-space Singaporean housing planning is added with fens or half-floor high drive-way circle, and housing unites are often marketed as gated communities. Flyers for such gated communities are replete with images of luxury urban living, with high quality hospitals and schools where eco-city residents receive priority for treatment and enrollment, and with community-owned lakes, forests and parks for everyday recreation

[54] The current housing units allocation is 60 percent for high income population, 20 percent for medium income populaiton, and 20 percent for low income population (that will be designed as affordable housing units).
[55] Interviews with TJEC03 in September 2011.
[56] TJEC06 in September 2011; and TJEC07 in September and October 2011.

(for example, see Figure 3.5). These changes signal a tendency towards a property-based eco-city of gated eco-communities, compromising social for economic sustainability.

Figure 3.5 Real Estate Flyer

A number of other implementation difficulties also have emerged. Chinese eco-city planners I interviewed stressed the challenges of being a pioneer in national ecological urbanization experiments. Interviewed planners felt that the collaboration with Singaporean urban planners and governmental officials was privileging the construction of residential housing development, rather than the introduction of new green technologies. Struggling with the lack of established standards for construction beyond policy guidelines, SSTECAC sought alternative consulting expertise, eventually turning

to a newly established Chinese consultancy, Bluepath City Consulting, to develop a new implementation plan.[57] The new plan shifts the focus from the scale of the eco-city towards that of individual green building construction.

At the latter scale, with the help of Bluepath green building standards are being developed that exceed those that Singapore had proposed. Tianjin Eco-City planners are working to revise the U.S. based Leadership in Energy and Environmental Design system (LEED) certification standards to fit Chinese cities, with the ambition of creating a new set of standards that can compete with LEED across Asia.[58] Interviews confirm that green building standards are also the focus of the national indices and measures for evaluating Chinese eco-city projects, being developed in collaboration between SSTECAC and the National Ministry of Housing and Urban-Rural Development.[59] Local and national planners offered somewhat different perspectives on this move. One planner wholeheartedly believed that this is the right path: "Eco-city needs to be defined by green buildings. It is practical, replicable, and the only way to make eco-cities anywhere."[60] In contrast, another expressed concern that the notion of an eco-city is being reduced to an agglomeration of green buildings: "If we can have a city composed of green buildings, I guess it can still be called an eco-city... It is also the best we can do."[61]

---

[57] Bluepath was founded by a Chinese planner who previously worked for Arup on the Dongtan project.
[58] Tianjin Eco-City's green building guideline is still in development, but it will mainly be a revision of the LEED silver rating criteria for new construction (see LEED's official website for details: http://www.usgbc.org/leed/rating-systems/new-construction). The most recent green building construction guideline for Tianjina eco-city can be found in *Navigating The Eco-city (dǎo háng shēng tài chéng shì*) (SSTECAC and Bluepath City Consulting, 2010: 429*)*.
[59] Interviews with TJEC01, TJEC02, TJEC03 in September 2011.
[60] Interview with TJEC01 in September 2011.
[61] Interview with TJEC03 in September 2011.

Summarizing, the implementation of Tianjin Eco-City poses some serious questions about what constitutes an eco-city, whether Tianjin Eco-City qualifies as such, and whether China can achieve ecological urbanization simply by replicating green buildings. First, there is much debate about whether green buildings are in fact environmentally sustainable (e.g., Newsham et al., 2009; Scofield, 2009). Second, is the question of whether an agglomeration of green buildings constitutes a green (eco-)city. Third, the Tianjin Eco-City model promotes a version of eco-cities that detaches them from the indigenous eco-system to meet urban eco-governance goals. This alternative to the circular urban economy model, where cities are in harmony with their environment, seems to leave minimizing carbon/ecological footprints as the only eco-city policy option, in alignment with the "carbon control" phase of environmental governance identified by While et al. (2010).

4. Conclusion

The increasing importance of eco-state restructuring in China can be seen in its emergence as the world's largest producer of green technologies in monetary terms, in the centralization of environmental governance at the highest level of the state and the enshrinement of ecological goals in its national development plans, but also in the explosive growth of eco-cities after 2004. In 2004 Dongtan represented itself to be China's first eco-city; by 2011, 230 cities were claiming this status. Tianjin Eco-City had

emerged as the best practice eco-city, and the conceptions and priorities driving eco-city initiatives had profoundly shifted.

These shifts from Shanghai Dongtan Eco-City to Tianjin Eco-City closely tie to the transitions of China's regulatory regime from a decentralized, entrepreneurial phase to the post-crisis phase emphasizing welfare provision, and were motivated by emergent challenges from the most recent phase of rapid urbanization: highly polluted urban environments and severe water supply and management problems, an outdated urban industrial infrastructure, and the excessive concentration of urbanization along China's southeastern coast. Seeking an eco-city model that could respond to these challenges, the conception of eco-cities as being in harmony with their natural environment was replaced by a conception of eco-cities as capable of creating green environments and a high quality of urban life everywhere. In order to realize this conception, the Chinese state initiated collaboration with Singapore national government, picking Tianjin-Binhai as the site for a new model that should be replicable also across northern and western Chinese urban environments. Tianjin Eco-City's master plan emphasizes practical green technologies and the creation of green eco-systems *de novo*, as well as residential housing construction following Singapore's philosophy of urban design and development. The deepening involvement of Chinese central government in Tianjin Eco-City, its inclusion of social welfare provision for housing, education and medical care into the eco-city master plan, and its ambition of providing universal eco-urban living, all reflect China's post-crisis transition in its regulatory regime. Even as China departs from European and North American eco-city conceptions, there are marked broader-scale parallels in the

shifting phases of eco-state restructuring: from pollution control to sustainable development and now carbon-neutral territorial initiatives. As in Europe, this periodization is better characterized as sequential layering than phase shifts. But such parallels are constructed in geographically specific governmentality, policymaking and implementation process, and strategically shaped as the pathway toward China's "Eco-civilization" and "harmonious society."

Nevertheless, significant implementation challenges in Tianjin Eco-City have resulted in an emphasis on attracting wealthy households, undermining social sustainability. Implementation challenges have also contributed to a downscaling of the idea of an eco-city to that of eco-buildings, based on new green building standards tailored to the Chinese context and beyond, raising questions about ecological sustainability. Yet such challenges have not blunted Tianjin-Binhai's flagship eco-city status. Clearly, the resulting model departs substantially from the principles of sustainability behind western planning conceptions of what constitutes an eco-city. This also shows quite clearly how Chinese national politics shapes discourses about and conceptions of eco-cities, overriding the conflicts between ideal and reality. Even in the west, contrasting approaches to ecological and social accounting result in very different measures of sustainability, which cannot be resolved within this technical domain (Bergmann, 2013). This is again even more the case when geographical differentiation is taken into account, as the two decades of debate about the Kyoto Protocol have shown.

The downscaling of urban environmental design noted above contrasts with an upscaling of urban environmental governance to the national scale, re-territorizing the

Chinese eco-state and ecological urban experiments. Notwithstanding the pressure on cities to engage in urban entrepreneurialism, the central state has assumed a greater stake and involvement in framing thinking on and developing a regulatory framework for eco-cities. The inter-state cooperation with Singapore further extends eco-state restructuring beyond the national scale. These illustrate how China's urban ecological experiments have shaped shifts in the spatiality of eco-regulation, even as eco-state regulation frames such experiments. Beyond this, the Chinese case inevitably raises questions about the concept of eco-state restructuring. These include questions about its applicability beyond capitalist political economies and in the Global East and South, and questions about its territorial inclinations. For example, the China-Singapore collaboration illustrates the importance of relational inter-territorial processes. As China persists with its own brand of environmental governance, and as Tianjin Eco-City emerges as a model with the potential to be replicated beyond China, this study suggests that there remain important conceptual as well as empirical challenges for further research on eco-cities and eco-state restructuring.

CHAPTER FOUR

Mobile Eco-Urbanism in a Globalizing China:

Assemblage, Mobility and Mutation

In May 2004, planners from the London-based urban planning and engineering firm Arup and Chinese local officials met at the Chongming Island, a piece of mostly undeveloped wetland at the outskirts of Shanghai, to discuss an ambitious urban development plan. In the meeting, the Arup delegation, led by architect Alejandro Gutierrez, presented their plan to make Chongming Island into a world-leading model for future urban living. Specifically, they proposed to build the island into an ecologically friendly and self-sufficient city that produces zero carbon emission, features innovative urban agriculture technologies, and generates its own energy from alternative sources. This city, later to be known as Shanghai's Sino-British Dongtan Eco-City (Dongtan from here on), was the first eco-city project in China and became the foundation of a best-practice model for the world. Other cities in and outside of China sent planners and policy makers to visit project site and learn about Dongtan's vision, design, and technologies. The mayor of London, Ken Livingston, announced that their Thames Gateway Development Project would "bring back" products from the green experiment designed by British planners and conduct at Dongtan (also see London Thames Gateway Development Corporation, 2007a; 2007b). For much of the twentieth century, "imitative

urbanism" (Robinson 2006; Clarke 2012a) almost always meant cities in the Global South learn from cities in the Global North. But the notion is reconstituted now with Dongtan brought about a case featuring bilateral learning between the Global North and South.

As the first national eco-urbanization exemplar, from 2005 until its suspension in 2008, Dongtan became exemplary for Chinese eco-city development. Like Dongtan, most Chinese eco-cities have been developed under international partnership. International partners are attracted by China's large market of sustainable urban development (Wu, 2012), while Chinese local governments lack sufficient sustainable planning expertise and development funding that can be filled by their international partners. Eco-city development in China generally entails local governments or local semi-governmental companies (serving as governments' investment platforms), along with related central governmental authorities, collaborating with international development consultancies, policy think tanks, urban planners, prestigious architects, design studios and mechanical engineers to craft planning modules. Chinese eco-city model is produced through various study trips, bi- or multi-lateral meetings among Chinese and foreign actors that facilitate trans-local knowledge sharing in urban planning professional communities and policy networks. A variety of technological objects are generated: policy white books, urban design blueprints, master plans, feasible plans, zoning details, iconic green buildings and detailed site plans. The outcome should be constructing and implementing a vision of Chinese eco-cities. This process was inherited by Dongtan's successor, current national

eco-city exemplar, Sino-Singapore Tianjin Eco-City, even though Dongtan itself was never built.

From Sino-British Dongtan Eco-City to Sino-Singaporean Tianjin Eco-City, eco-city planning and implementation in China is embedded in a wider globalizing process, characterized by the involvement of diverse actors and the assemblage of complex social and material relations connecting places near and far, shaping contemporary urbanism and urbanity (McCann and Ward, 2011; 2012a). Although still influenced by traditional socialist planning legacy that subsumes urbanism into national economic targets, after market reform Chinese urban projects became entrepreneurial. With increasing local autonomy, Chinese cities welcome foreign professionals and finance, compete to construct symbolic landscapes, and aspire to become "global cities" (Abramson, 2006). Some scholars argue that eco-city constructions are also entrepreneurial in nature (for example, Wu, 2012; Chien, 2013; Chang and Sheppard, 2013).

However, research on the making of urbanism in China from a trans-local perspective is still limited. More scarce is the research on the making of eco-urbanism from such a trans-local perspective in both China and beyond. Although studies of eco-cities recently have proliferated, most of them are either attempts to theorize eco-cities at the general level (for example, see Joss, 2011; Joss et al, 2012; 2013), or case studies examining the difference between ideal and realities, planning and implementation (for example, see Chang and Sheppard, 2013; Cugurullo, 2013; de Jong et al, 2013; Joss and Molella, 2013; Shwayri, 2013). The external linkages coming in and extending from eco-city projects, relationally constituting and shaping the formation of eco-urbanism, are still

largely unexplored not only for Dongtan, Tianjin and other Chinese eco-cities, but also for other globally renowned eco-city projects, such as Masdar (Abu Dhabi), Sangdo (South Korea) and Curitiba (Brazil). With respect to China, research that examines the making of Chinese urbanism from a trans-local perspective is very limited.[62]

In this chapter I attempt to situate Chinese eco-urbanism within complex trans-local relations and in the planning history of eco-cities, exploring the various connections of Shanghai-Dongtan and Tianjin-Binhai Eco-Cities—the exemplars shaping current Chinese eco-city "best practice" principles (Chang et al, 2013). Informed by the literature of mobile urbanism and assemblage theory, I interrogate the inter-relations between local and international urban planning actors and the global circuit of green urbanism knowledge: How have these contributed to Chinese eco-city "best practice"? In what ways do knowledge and technologies of eco-urbanism travel across geographical locales? How does eco-urbanism mutate as it travels? I do so by means of investigating three dyads: between the two sites (Dongtan-Tianjing), and linkages of each site with its foreign partners (Dongtan-London, Tianjin-Singapore). Thus I seek to go beyond a tale of two flagship Chinese eco-cities, to unravel the intricacies of how contemporary eco-urbanism is co-produced in this globalizing era.

This research is based on a multi-sited, multiple-method research since 2010, including archival research, textual and discourse analysis, in-person semi-structured and

[62] One exception is the work of Xuefei Ren (2011) that examines the international production of symbolic architectures in Shanghai and Beijing, detailing the networking and cultural politics of architectural firms. But her work mostly focuses on what happens on-site, instead of the diverse and complex extra-urban connections that constitute, condition, or intermediate the production of Chinese cities.

open-ended interviews and participant observation at Shanghai, Tianjin, London and Singapore. Archival materials include reports and documents concerning sustainability policies, both for China in general and specifically related to Dongtan and Tianjin; government publications; sustainability and eco-city brochures and educational booklets; press coverage; online resources (such as sustainability internet groups and Chinese eco-city advocacy blogs); and academic publications. These documents are analyzed for the rationales and thinking about eco-cities emerging with respect to and circulating around the Dongtan and Tianjin Eco-City projects. Thirty-eight actors and key informants involved in Dongtan and Tianjin Eco-Cities were interviewed, focusing on a) the kinds of connections and networks that have emerged between Shanghai, Tianjin, London, Singapore, and with global policy networks; and b) how these networks have been influencing the two eco-city projects. As I guaranteed anonymity to the interviewees, their names and positions were recorded by codes comprising a four-alphabet abbreviation of job affiliation and a randomly assigned two-digit number.

1. Building eco-cities in a globalizing China: assemblage, mobility and mutation

The term of eco-city was firstly coined in 1987 by Richard Register, a California based (Berkeley) environmental activist. Register defines eco-city as a city with minimum input of resources and output of waste, with compact physical layout fitting into bioregion and a vibrant egalitarian civil society (1987; 2002). Eco-cities are often linked with Ebenezer Howard's garden city movement, advocating urban design that is

local-oriented, small in scale, with careful allocation of green belt, residency and various economic activities (White, 2002). Since the creation of the term, the meaning of eco-city, however, has diversely evolved. Particularly with the emergence of sustainable development discourses in the 1990s, eco-cities were framed around objectives of sustainable development. Their definition became as elusive as the concept of sustainable development, covering a wide range of ideas including wetland restoration, preserving urban eco-diversity, public transportation, reduced car use, pedestrian bicyclist city, affordable housing, economic prosperity, new green technologies and more (Roseland, 1997; Beatly, 1999; Kenworthy, 2006; Suzuki et al, 2010). The marriage of eco-city and sustainable development also results in that many sustainable urban projects not mainly featured with ecological sustainability measures are now labeled as eco-cities (e.g., Curitiba, Brazil and Freiburg, Germany).

The elusive definition also leads to various forms of eco-cities. Joss (2009) conducted a global survey investigating 178 eco-cities, with a follow-up survey with his colleagues in 2011 (Joss et al, 2011). They identify that eco-cities range widely, from small to large projects that are new-built, expansions of urban areas, or retrofitting existing cities to adopt eco-city principles. This finding reflects the elusiveness of the definition of eco-city. Indeed, Joss suggests that eco-city has become an "umbrella term that covers various notions of and approaches to sustainable urbanism, rather than a conceptually coherent and practically uniform phenomenon" (2012: 5; also see Rapoport, 2014). While eco-city can not be used to define a single, unified form of eco-urbanism, becoming an umbrella term also makes eco-city a "master signifier" (Davidson, 2010),

opening space for cities and diverse actors to fluidly interpret eco-city-ness, to assemble normative and practical ideas for achieving various purposes, and to evoke a variety of imaginaries for future urban living. It is therefore not surprising that different technologies, frameworks, and indices have been proposed in recent years by international organizations,[63] leading international urban planning firms, development consultancies, engineering firms,[64] and local governments as solutions to various urban development challenges.

This proliferation of eco-city frameworks and programs has co-evolved with the internationalization and trans-localization of eco-urbanism. Based on global survey results, Joss et al (2013) find that the international policy and knowledge transfer process, particularly the involvement of international consultants and foreign governmental partnerships and reference to powerful international environmental organizations, is a major characteristic of eco-city development since 2000. They note also that trans-local collaborations predominantly take the form of North and South partnerships.

Indeed, contemporary urban development in general is highly internationalized, deeply embedded in trans-local circuits of knowledge production, including planning technologies and professional networks (Roy, 2009; 2011; Healey, 2013). North-South urban development partnership also has a long history dating back at least to the middle of last century, evident in many urban modernization projects (Clarke, 2012). However, before the 2000s, particularly in political sciences, the globalization of urban

[63] Such as World Bank Eco2 Cities, OECD Green Cities, UN-Habitat and Ecocity Builders' International Ecocity Framework and Standards, European Commission Ecocity programmes

[64] For example, Arup, Siemens, Hitachi, Foster and Partners, Atkins each has their own internal eco-city guidelines.

development was mostly theorized at the national scale, as part of the international knowledge or policy "diffusion," "dissemination" and "learning." The knowledge or policy was conceptualized as intact packaged expertise, parachuted from the North (as expertise provider) into the South (as receiver) (Dolowitz and Marsh; 1996; Peck, 2011; Dussauge-Laguna, 2012).

Recently, however, a school of research has emerged around "policy assemblage, mobility and mutation," proposed to re-theorize cities and their interrelationships. This approach focuses on trans-local relations (between municipalities, but also with national or international governmental organizations and between local authorities and their constituents) and conceptualize new urban planning and design strategies as social products that move across places and constantly involve in diverse actors and their different rationales and interests (McCann, 2008; 2011; MaCann and Ward, 2010; 2011a; 2011b; Peck and Theodore, 2010; Clarke, 2012; Temenos and McCann, 2013). This approach also resonates with discussions of "worlding" (Roy and Ong, 2011), whereby cities in the global South (particularly in the Gulf States, India and China), are seen as important nodes of emergent global order (McCann et al, 2013), formed and reformed by flows of capital, labor, ideas and vision. This results in the assembling of "parts of elsewhere" (Allen and Cochrane, 2007:1171) in cotemporary urbanism, in discourses, imaginaries and the epistemes of urban planning, architecture and design (McCann et al, 2013: 585). Cities, from this perspective, are emphasized as "globally distributed centers and relays of expertise from which urban actors draw ideas in order to define and secure a

particular future" (McCann et al, 2013: 586). My research is situated within this body of scholarship.

The policy assemblage, mobility and mutation approach conceptualizes policy broadly, as bundles of expertise and techniques, learning and knowledge, gathered together for particular reasons and codified in multiple ways into forms of policy, planning or design strategies (Cook and Ward, 2012:779). This approach focuses on the actors, practices and representations that constitute and intermediate the (re)production, adoption and travel of policies, especially as they became "best practice." Heterogeneity, multiplicity, emergency, contingency, and the relative incoherent nature of the social formation of policy are at the center of analysis (Anderson and McFarlane, 2011). Specifically when policy is "in motion," its traveling pathways and mutations as it travels are as important as the policy itself and the places it influences (McCann, 2011; McCann and Ward, 2010; 2011; Temenos and McCann, 2013). More abstractly, in analyzing contemporary internationalized urban development, this approach therefore argues that relationality and territoriality are not dualities but mutually constructive, overcoming analytical dichotomies of fix versus mobility, and local versus global (McCann et al, 2013: 584). The making of urbanism and its circulation is not a disembodied movement from one place to another, but a social process enabling mutation and (re)assemblage. Cities are conceptualized as "open and internally differentiated, temporarily assembled, and given coherence but constituted in and through circuits, networks, and webs of varying spatial extent" (Cook and Ward, 2013:779).

Methodologically, the policy assemblage, mobility and mutation approach is empirical in orientation. First, it stays "close to practice" in following the mobile actors and urbanism models (McCann and Ward, 2012a). Genealogical and discourse analysis is indispensible to reveal the traveling policy technologies and text, and the networks with which they are associated (Peck and Theodore, 2012: 23-24). In order to unpack the "black box" of trans-local partnerships, this approach relies on detailed description of policy actors who mobilize policy and engage with trans-local circuit of policy knowledge, their representational strategies, and the technologies that are deployed, learned and modified in moving urbanism models. Actors include not only elite policy makers, "starchitects," and hegemonic institutions and actors, but also those "middling technocrats" engaging in everyday technocratic work: engineers, planners, officials, surveyors and development professionals all embody, spread and translate the urbanism models (Larner and Laurie, 2010). Attention is also given to various activities and venues where actors and technologies are convened, such as conference, study trips, site visits, meetings, seminars, workshops, guest lectures, and informal dinners, among many others. The various activities where actors and technologies intersect, such as conferences, study trips, site visits, meetings, seminars, workshops, guest lectures, and informal dinners, are also of interest. In short, this approach inherently engages with the multi-sited social and material processes through which the materiality of urbanism, and its rationales and routines, are constituted (Peck and Theodore, 2012; McCann and Ward, 2012a).

Second is the situated context in which urbanism is (re)assembled. This approach concerns "the double movement" of policies that circulate between cities while also

changing in character to fit with different contexts (Clarke, 2012b: 28). Context, here, references both the socio, economic and material context conditioning policy development, travel and reception, as well as "informational infrastructures" ranging from professional organizations, supranational institutions or any frameworks/systems for framing, translation and legitimizing (Clarke, 2012b; McCann, 2013: 9). It is also equally important to position the immediate context of mobile policy within the broader political economic structures – i.e. "the context of context" (Brenner et al, 2011). Attending to the context of context is argued as important to unveiling the formation of capital accumulation, configurations of uneven spatial development, multi-scalar frameworks of state and urban governance, and diverse forms of sociopolitical contestations (Brenner et al, 2011:233-234).

However, the policy assemblage, mobility and mutation approach faces one potential pitfall: "presentism" (Temenos and McCann, 2013). The empirical studies in literature of policy assemblage, mobility and mutation are mostly about current successful policies, such as Vancouver green urbanism, Shanghaism, Barcelona urban regeneration model, and Business Improvement District etc. But precedence, unsuccessful projects, and future imaginaries may also constitute the evolution of urbanism. McCann and Ward argue that the relational sites of policy assemblage, mobility and mutation are where "past successes," "current problems," as well as "future scenarios" all co-exist (2012:47). While imaginaries for urban future has been mentioned in studies on mobile urban entrepreneurial policies (for example, see urban boosterism in

McCann, 2013), many urban scholars have turned to explore the urban planning mobility in historical context (for example see, Harris and Moor, 2013; Healey, 2013).

A few also pay attention to failed projects. McFarlane argues that failed experiments can be important "because the process itself can begin a formal relationship that may introduce new habits of working and challenging regimes of truth, as well as building capacity of engagement" (2011b: 373). Peck (2011), citing neoliberal reforms in east European countries, discusses how failure results in redoubled reform efforts that enable policy models nevertheless to spread. He explains that since policy transfer is generally based on previously successful cases, failure in new places is blamed on domestic political conditions or implementation failures. As Peck argues, failure triggers increasingly hectic rounds of institutional engineering; "policies were spreading, in this sense, not by succeeding but by failing, as underperformance of the first-round reform efforts became the rationale for more stringent measures" (Peck, 2011:782).

Despite of these conceptual discussions, to date there are very few empirical studies of the mobility and mutation of failed projects. This chapter seeks to begin to fill this gap. I trace the genealogical connections between a failed and a successful Chinese eco-city, following actors and teasing out the contexts and the infrastructure that facilitate the making of exemplars (including planning process and international partnerships). This enables me to investigate the role of a failed urban policy experiment in shaping the current successful model. With 230 eco-cities identified in China (CSUS, 2011) and 178 further around the world (Joss, 2010; Joss et al, 2011), studying these two internationally influential eco-city exemplars will also enrich our understanding of the proliferation of

eco-cities, and the complex social and material relations underlying this proliferation process. I also seek to unpack the politics of exemplars being conjured up under the eco-city "master signifier": how certain features become prioritized in eco-cities, whether and how these urbanism models evolve and mutate as they travel, and how the making of eco-urbanism is embedded the wider structure of contemporary globalizing urban development.

2. The two models: Sino-British Shanghai Dongtan Eco-City and Sino-Singaporean Tianjin Binhai Eco-City

After more than two decades of rapid manufacturing-based economic growth at the cost of severe pollution, China has turned to emphasize eco-urbanism as a means to achieve "ecological civilization," an attempt that can be traced back to China's 11th five year plan. Dongtan Eco-City in Shanghai was first proposed in this context. Following an initial development consulting report from McKinsey in 2004, the London-based transnational engineering and design firm Arup, was invited to design a master plan on Shanghai's last undeveloped peri-urban land. Arup collaborated with the Shanghai Industrial Investment Company (SIIC, a Shanghai municipal government public-private pharmaceutical and real estate company listed on Hong Kong's stock market), Chinese and British state agencies, universities, and planning institutions.[65] The Chongming

[65] Other participants included Sustainable Development Capital LLP (finance), Monitor Group (consultant), HSBC. Rider Levett Bucknall (known as Lavett & Bailey before a 2007 merger), Jones Lang LaSalle and CB Richard Ellis also participated and acted as real estate development consultancy companies.

county government (under Shanghai's municipal government) also subsequently established construction and real estate companies to build eco-housing in and around the project site, seeking to elevate Chongming's visibility in the domestic housing market. As a high profile project, Arup recruited the leading sustainable urban planner Sir Peter Head in 2005, to pull together a transitional team to work on the master plan.

Reviewing existing eco-city ideas, Head coined "integrated urbanism" as the planning concept, incorporating human livelihoods and the physical environment into a self-sufficient eco-system with a low ecological footprint. Under this framing, Dongtan was designed as a city of 500,000 people, with local jobs in businesses, ecotourism, ecological and environmental related education institutions, and research and development firms. Only 40% of the project site was planned for urban use, with the rest expected to remain under agricultural or fisheries production. Organic "plant factories" were to be installed underground, using solar powered LED lights to increase agricultural self-sufficiency. The eco-city was expected to rely on electricity generated by burning rice husks, solar panels and wind turbines. Dongtan was presented as a compact city, with low-rise condominiums and high-tech energy-saving homes interspersed with green spaces, well integrated into the pre-existing wetland natural landscape (Figure 4.1). Three villages were planned, surrounded by eco-farms, theme parks and wetland. The city would grow along public transportation corridors, restrict car use, and aim to achieve zero-carbon emission. Arup also planned a waste management system utilizing recycling, reuse, and organic waste methods, and consumer-driven green-governance for energy

saving—encouraging local residents to conserve energy through smart metering and financial incentives (SIIC and Arup, 2006; Arup, 2008).

Figure 4.1 Dongtan Eco-City Planning Illustration: Site Overview
(Source: Holcim Foundation)

The project failed. Dongtan has been halted infinitely since 2008 and then was officially pronounced dead in 2010. The reasons of failure are many, but domestic discourses stress three aspects. First, is its "inappropriate location": Dongtan was planned to be built on wetland, which subsequently was assessed as a conservation region and not appropriate for human settlement. Second, Dongtan's continuation was significantly affected by changing leadership. From the beginning, Shanghai mayor Chen Liangyu had provided major political support for Dongtan. But Chen was convicted of corruption in 2008, and the new major was not supportive of Dongtan as it was targeted as Chen's pet project. Third, Dongtan's design was innovative, with many technologies in use for the

first time in urban development. This made the design expensive and financially barely affordable (May, 2010; Qiu, 2009; 2011; Wu, 2012).

Notwithstanding the failure of Dongtan, China's eco-city initiatives continued to grow dramatically, from 82 in 2005 to 230 in 2011 (CSUS, 2011). Immediately following the suspension of Dongtan Eco-City, China announced a second flagship eco-city project to be built at the Binhai New Area in Tianjin. This time, a group of Singaporean government planning officials, instead of British private sector experts, flew in to collaborate on this Sino-Singapore eco-city. The first part of Tianjin Eco-City was completed in 2011, making it the first newly constructed eco-city in China.

The Tianjin Eco-City is jointly designed by the China Academy of Urban Planning and Design, the Tianjin Urban Planning and Design Institute, and a Singapore planning team led by its Urban Redevelopment Authority.[66] The project site is largely non-arable, polluted wasteland, which is to be transformed into a livable high-density city. The eco-city has adopted Singaporean style high-rise residential towers (Figure 4.2), and is envisaged to house 350,000 permanent and 60,000 temporary residents on 34.2km^2, a medium size city by Chinese standards (SSTECAC, 2009).

[66] Other participants include Sino-Singapore Tianjin Eco-City Investment and Development Corporation (a joint venture between Tianjin TEDA Investment holding company and a Singaporean consortium led by Keppel Group, a Singapore based transnational conglomerate), and real estate developers including Keppel (Singapore), Shimao and Vanke (China), Farglory (Taiwan), Mitsui Fudosan (Japan), Ayala (Philippines), and Sunway (Malaysia).

Figure 4.2 Tianjin Eco-City Planning Illustration
(Source: SSTECAC, 2009, Tianjin Eco-City master plan)

Following the integrated urban planning approach proposed developed for Dongtan, Tianjin Eco-City is designed as a self-contained city, detached from its unfavorable natural environment (Chang et al, forthcoming). The major concept of its master plan is "eco-valley," proposed by Jeffery Ho from Surbana Consultancy (a semi-governmental Singaporean planning and design firm, wholly owned by Temasek Holdings, the investment vehicle of Singapore's government) and his team members from the Urban Redevelopment Authority. As a landscape planning metaphor, Ho imagined high-rise buildings as analogous to hills in a natural environment. A connecting valley, where all the residents can "come down" for various activities, is seen as necessary to

connect the hills into an integrated region.[67] Therefore the focus of the Tianjin Eco-City master plan is a central connecting greenway, the "eco-valley," along which transportation and infrastructure lines are allocated. The eco-valley threads up four residential districts, three business centers, and recreational parks. The residential districts are aggregated by housing blocks, called "eco-cells," each occupying an area of 400 by 400 meters with four to five 20-30 story high-rise residential towers and shared basic infrastructures, schools and businesses. Four eco-cells make up an "eco-community," and four to five eco-communities constitute an "eco-district" with a business center (Figure 4.3) (SSTECAC, 2009).[68]

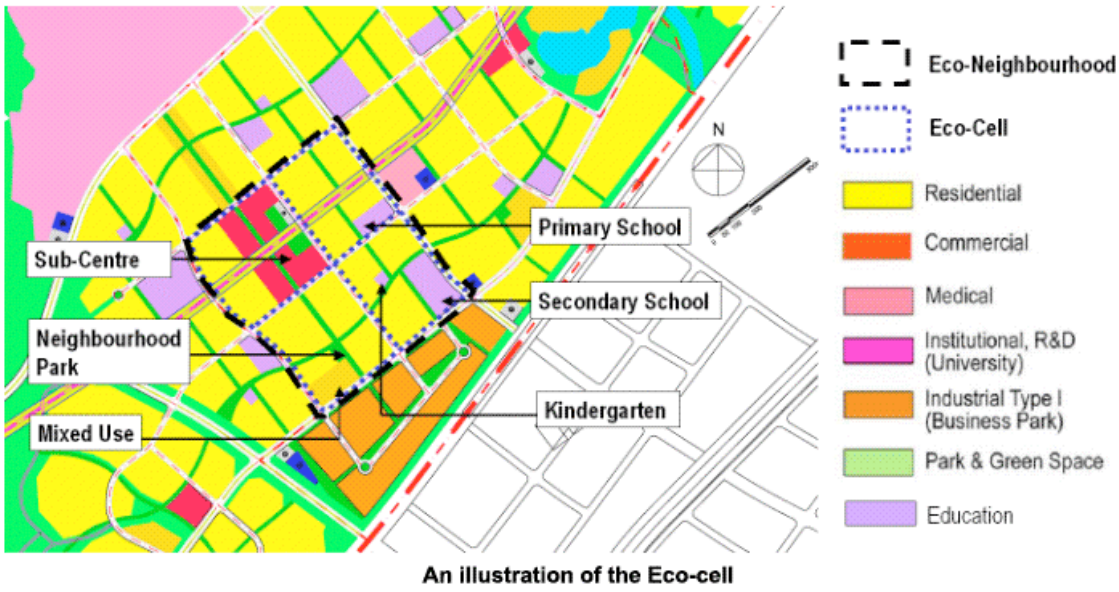


Figure 4.3 Eco-Cell
(Source: SSTECAC, 2009, Tianjin Eco-City master plan)

[67] Interview with Jeffery Ho in March 2013.
[68] Also see http://www.tianjinecocity.gov.sg/

In deliberate contrast to Dongtan, Tianjin Eco-City has no ambition in achieving zero carbon emission and 100% renewable energy. Rather, it features technologies seen as practical, replicable and affordable (SSTECAC, 2009; unknown). Wind turbines and solar panels are proposed to supply renewable energy for up to 20% of total energy consumption, with the remaining 80% coming from two combined heat and power plants outside the city. The eco-city features green transportation, including rail transit, slow mobility systems (pedestrian and bikes), separation between pedestrian and vehicular traffic, and investment in the development of electric cars (a joint technological innovation with General Motors); but Tianjin Eco-City also allows conventional vehicles. As to water supply, the Tianjin Eco-City expects at least 50% water consumption to come from non-conventional sources by 2020, including collected precipitation, distilled seawater and reclaimed wastewater. Economically, it plans to specialize in service industries, and become an educational and R&D center for environment-related technologies. It is currently attracting investment from the software, animation and pharmaceutical industries, and aims to expand tourism and education-related services (World Bank, 2009; SSTECAC, 2009).

3. Connections between Dongtan and Tianjin

In contrast to the Tianjin Eco-City's success story, Dongtan has been publicly denounced as a "counterfeit" eco-city (Qiu, 2011). Dongtan's once praised eco-urbanism features are now represented as environmentally unsustainable and economically

unrealizable. Thus while most Chinese eco-cities initiatives cite Tianjin Eco-City as a reference model, none claims to be inspired by Dongtan. Although Tianjin and Dongtan are generally assumed to be independent projects, positioning them within the inter-referencing practices and professional/personal networks of sustainable city planners reveals the connections between them. Tracing the involved actors and novel planning methods and practices of collaboration with foreign partners triggered by the Dongtan project, I argue that Dongtan's failure in fact continuously facilitates and shapes subsequent ecological urbanization experimentations in China.

Study trips

Although not well documented, Dongtan was one of the most important study trip destinations for eco-city planning during its development. A local chief official in the tourism bureau on Chongming Island recalled that between 2006 and 2010, his office received four to five requests monthly to arrange study trips, a number that does not include trips directly planned by Shanghai municipality government or the Shanghai Industrial Investment Company. Although some were arranged for foreign groups, most study trips were for Chinese government leaders and planners from other prefectures. The total number of requests decreased after late 2010, when Tianjin Eco-City started to host visitors; nevertheless, the project site of Dongtan Eco-City continues to attract attention along with the associated eco-development projects on Chongming Island.

The first batch of Tianjin Eco-City planners and related government officials from both China and Singapore also went to Dongtan for a study trip in 2008. In interviews with major eco-city planners and a Binhai new area political leader, they all agreed the visit influenced how they perceived the idea of eco-urban living, shaping the planning of Tianjin Eco-City and nearby Binhai new area. One influence from Dongtan, as planners described, was waterfront development. Although Tianjin has a very different natural condition from Dongtan, planners and local government leaders thought that waterfront development, a main feature of Dongtan, should also be incorporated into Tianjin. Although none of these interviewees could be certain, they confirmed that the consensus of planning a recreational island, wetland park and man-made waterways in Tianjin Eco-City emerged naturally from visiting Dongtan and Chongming Island. Some even insisted on copying the detail plans from Dongtan onto Tianjin, irrespective of the very different social and physical contexts. In their study of Dongtan Eco-City, Pow and Neo (2013) document similar copying proposed by planners from Urumqi, the city once in competition against Tianjin for this Sino-Singapore Eco-City construction.

The study trip also initiated a series of discussions about following Dongtan to build water-theme parks. Since most land inside Tianjin Eco-City is planned for residential and commercial uses, however, the water theme park was diverted to the nearby Binhai new area. Mimicking the relationship between Dongtan Eco-City and the rest of Chongming Island, Binhai new area plans to establish water-front based eco-tourism to complement the Tianjin Eco-City's urban living, with a coastal leisure and

tourism area planned, including yacht docks and vacation homes quite close to the eco-city center (Tianjin Binjai New Area, 2009).

The other often noted influence of Dongtan on Tianjin concerned how to plan the eco-ness of the eco-city. In conversations with Tianjin Eco-City planners, they repeatedly mentioning that after the trip to Dongtan they realized building an eco-city is "not a hard thing to do." One planner detailed idea exchanges with Shanghai planners about how much "eco-planning" is necessary for an eco-city. Their conversation focused on how featuring just one eco-friendly strategy in each urban sector and infrastructure system would make a city eco-city.

> "After return [from the trip], I found eco-city planning is not necessary to be a whole new way of planning…Dongtan fell apart because it tried to achieve too many things at the same time. Tianjin needs to avoid it… Of course there are always new sustainability approaches, but we can still plan the bus routes as we have done in other places; just replacing regular bus by hybrid or electronic bus will do the trick; housing, water treatment, garbage recycling, all are the same thing."[69]

This description stresses differentiation from other non-eco cities by adopting easily achievable, and mostly less expensive, innovations. It echoes a pledge made on several occasions by many top Tianjin Eco-City officials: Tianjin Eco-City would be a practical and replicable eco-city, not the state-of-the-art green city but still greener than most current Chinese cities (for example, see Wang, 2009).

[69] Interview with TJEC03 in September and October 2011.

Other things learned in the trip concerned marketing strategies and professional networks. For Dongtan, consulting and planning contracts with Arup included international marketing, an experience that was passed onto Tianjin. Tianjin planners learned marketing strategies such as inviting key eco-city professionals and activists to the project site, holding conferences and workshops, as well as contacting the international media for coverage. The connections with key professionals in the eco-city industry built in Dongtan also were passed to Tianjin's Chinese and Singaporean planners. These connections later provided channels for Tianjin Eco-City planners to seek other foreign support when facing difficulties in planning and implementation, while also helping Tianjin gain international visibility.[70]

A new planning paradigm

Chinese urban planning long has been subordinate to the socialist planning tradition, providing urban space for centrally planned economic targets according to government dictates. Even after the City Planning Act in 1989, which introduced multi-level planning procedures to include district, control and detailed site plans (Figure 4.4), urban planning remained a top-down and linear process, less a regulation tool than one to achieve economic development (Yeh and Wu, 1999; Abramson, 2006). Local master plans and district plans tend to be used as blueprints by local governments and their semi-governmental development firms to accommodate immediate development needs

[70] For example, following a suggestion from Bluepath, Tianjin Eco-City repeatedly invites Richard Register to visit the site and write an assessment report for the SSTECAC.

(Abramson, 2006:204). Thus pre-master plan surveys of local natural, social and economic conditions and feasibility studies are largely absent. Without such surveys and studies, in the later stage of a development project, the final detailed control plans, site construction plans, and actual implementation quite commonly deviate from the master plan (Yeh and Wu, 1999).

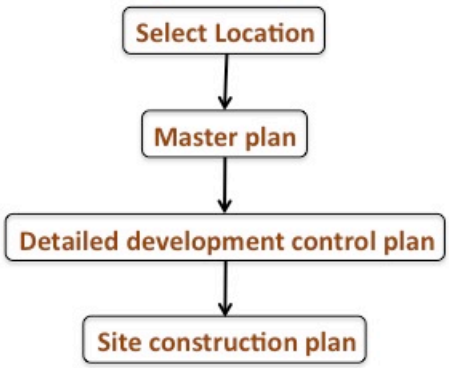


Figure 4.4 Conventional Project-Based Planning Procedure after 1989 City Planning Act (prepared by author)

The planning practices brought by British planners to Dongtan challenged this Chinese approach. In order to plan a city that fits into the local eco-system, Dongtan's planning process took 6 months. It started with a detailed survey of the construction site's natural, social and economic conditions, quantified data the survey data, and continued with multiple scenario simulations and a series of back and forth alterations of the master plan. The detailed control and site construction plan were drawn up alongside the master

plan, allowing coordination among them (Figure 4.5). (It was also influenced by the invention of the IRM model planning software, discussed below).

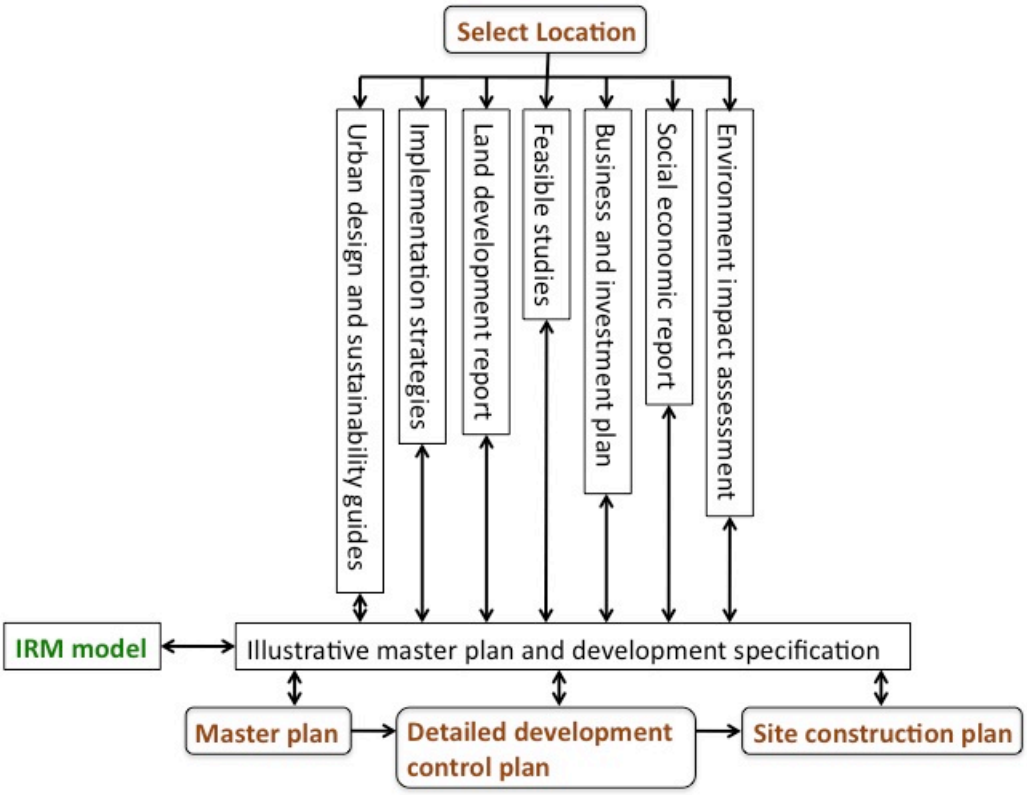


Figure 4.5 Dongtan Eco-City's Planning Procedure
(prepared by author)

Whereas these planning procedures are common to urban planners in other countries, it was revolutionary for the bulk of Chinese planners. One local planner based in the Shanghai government's planning institute described his planning routines before Dongtan: "We generally finish a master plan in less than a week or two. Leaders tell us what this place is going to be, we circle out the site on map, make a master plan, and send

it to the construction bureau."[71] After Dongtan, the planning institute started to focus more on pre-planning surveys for newly built regions, and closer coordination among different plans. By the time this planner was sent to work on a smaller scale eco-town project in a nearby province in 2010, the Shanghai government's planning institute had already adopted pre-master plan surveys as a regular procedure for its sustainable projects. Through various study trips, many planners gradually familiarized themselves with Dongtan's planning procedures, implementing these in Tianjin and other Chinese eco-cities.

As described by a key planner of the Tianjin Eco-City, Dongtan's experience gave him a very good sense of the pre-master planning work that includes surveys and feasibility studies on land and water conditions, air quality, biodiversity, and environmental impacts[72]. These pre-master planning investigations turned out to be particularly helpful for making detailed control plans and scheduling implementation phases. But given the very short history of pre-master plan surveys for sustainable urban projects in China, only a limited number of domestic professionals could perform those surveys and undertake environment and feasibility assessments.[73] Therefore, in addition to seeking help from Singaporean partners, Tianjin Eco-City also relied heavily on the professional networks formed during the Dongtan peoject to perform these tasks. Specifically, Tianjin Eco-City signed a consulting contract with Bluepath City Planning,

[71] Interview in October, 2011.
[72] Interview with TJEC03 in September, 2011.
[73] This in fact also reflected in various international eco-city programs between China and other countries. For example, some interviewees indicate that in the US-China Eco-city program led be the Department of Energy, Chinese delegates have expressed concerns about the lack of experienced professionals and firms in conducting feasible assessment, and therefore ask US's technical assistance.

a new consulting firm established by the leading planner Shanfeng Dong, who had worked closely with Peter Head at Arup in Dongtan. Whenever uncertainties emerge about planning or implementation issues, Bluepath is the first to be contacted.[74] It has also provided practical suggestions or further bridged Tianjin Eco-City planners with other foreign companies.[75]

Based on my informal conversations with two consultants formerly employed by Bluepath, at least until the end of 2011 many of these connections bridged to Tianjin Eco-City were based on Dongtan's networks, particularly with and through Arup. Bluepath also provides similar consulting services for many other Chinese eco-cities, publishes guidelines on eco-city planning process with Tianjin Eco-City, and plans to extend its business overseas. It is therefore reasonable to believe that, notwithstanding its suspension, Dongtan Eco-City remains influential over other eco-city projects, facilitating the adoption of a new planning paradigm and the assembly of professional expertise for eco-city planning in China.

Reassembling Singaporean public housing practices

When Dongtan failed, many Chinese government officials and local commentators publicly argued that the failure was foreseeable because the British eco-city vision doesn't fit Chinese society. For example, the relatively low-density design of Dongtan was criticized as not pragmatic for Chinese massive population and rapid pace

[74] Interview with TJEC02, TJEC03 in September 2011; LNBP01 in January 2013.
[75] Interview with TJEC03 in September 2011; LNBP01 in January 2013.

of urbanization (Qiu, 2009; 2011). Some also argued that collaboration with a private company was not politically and financially strong enough to build China's first eco-city, hinting at Arup's inability to help finance the Dongtan project (de Jong et al, 2013).

By the mid-2000s, a popular political discourse started to prevail, urging local governments to find a "Chinese model" for local development projects, and implying that Western models are no longer politically preferred. This framed the choice of Singapore as the partner for China's next national flagship eco-city project. Singapore's centralized political system and shared cultural elements with China no doubt fit the "Chinese model" discourse. Singapore also had been promoting itself as the "Garden City of Asia" since the 1990s. Equally important is that Singapore planning agencies are affiliated with the government, which can and is willing to finance mega-projects overseas. According to interviews with Chinese and Singaporean senior planners, high-level Chinese officials met with Singapore's officials several times at the end of 2006 to discuss transplanting Singapore's garden city model to China, thereby building an eco-city through learning from an "advanced Chinese society."[76] Formal inter-governmental agreement on collaboration on the Second National flagship Tianjin Eco-City was made at the end of 2007 (SSTECAC, unknown; SSTECAC, 2009).

Yet, to distinguish themselves from the failed Dongtan, Tianjin Eco-City started with very different planning features. Dongtan's integrated approach, fitting urban development to natural eco-system and landscapes, was abandoned in favor of a focus on engineering an artificial eco-city, with less concern about disrupting original natural

[76] Interview with TJEC01, TJEC03, BJIN01 in September 2011; SGSB01, SGLC02; SGOB01 in March 2013.

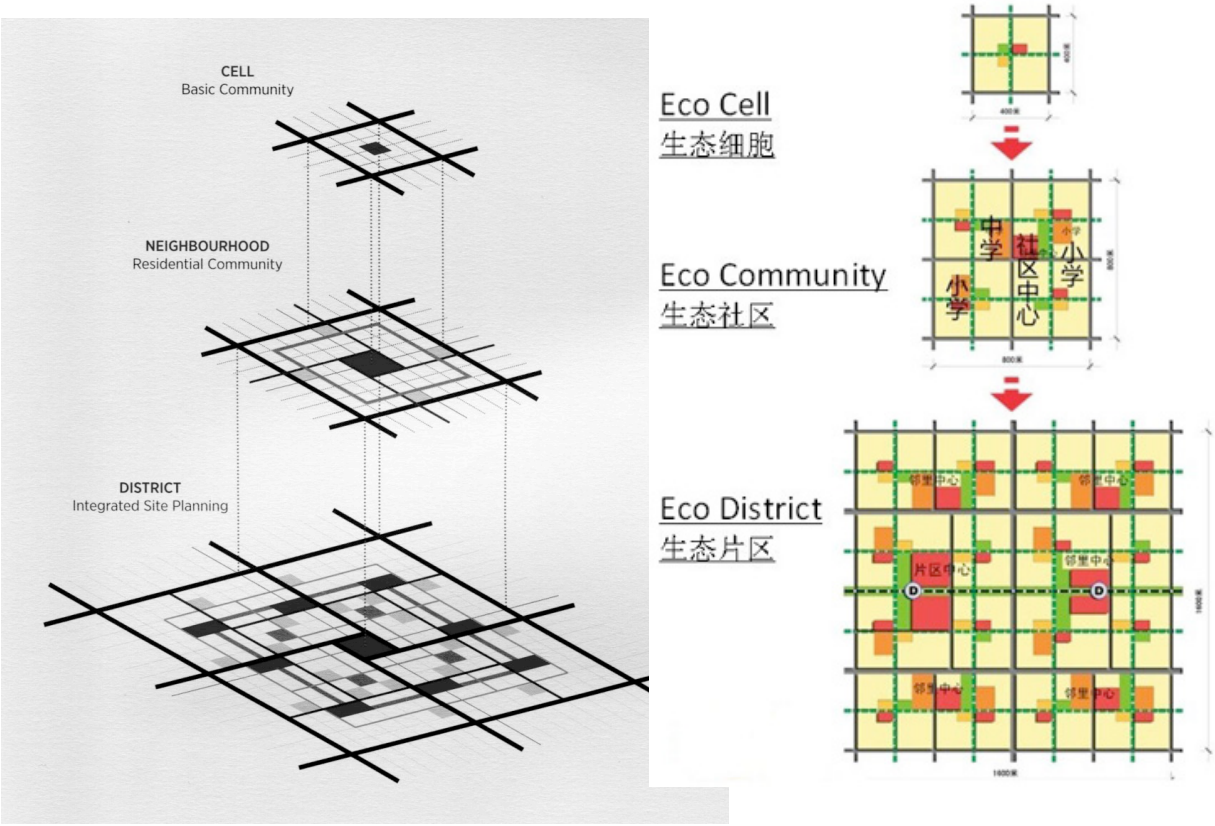
landscapes. Tianjin's eco-city featured high-rise buildings, in contrast to Dongtan's low-rise business buildings and European condominiums. Whereas Dongtan focused on proven technologies, novel to sustainable urban planning, Tianjin emphasized practical solutions that may not be novel (Table 4.1). In discussing these contrasts with the leading Singaporean master planner, he honestly pointed out many aspects of the planning of Tianjin specifically focused on generating an impression that Tianjin would be totally different. [77]

	Shanghai-Dongtan	**Tianjin-Binhai**
Development type	Greenfield (Wetland and farmland)	Grayfield and brownfield (Saltpan and wasted land)
Planning paradigm	Integrated design, symbiotic with local eco-system	Engineering artificial eco-system
Planning vision	Innovative and visionary: proven technologies newly applied to urban planning	Practical and replicable: practical new town public housing techniques that have been used in Singapore for more than 40 years
Landscaping design	Four to eight story low-rise condos integrated into green field	Twenty to thirty story high-rise residential towers in 400 squre meter housing blocks
Transportation design	Walking and hybrid bus	Above ground light rails and hybrid/electronic bus

Table 4.1 Two Eco-Cities' Planning Features

[77] Interview with SGSB01 in March, 2013.

Such a contrarian stance pushed Tianjin Eco-City planners to re-assemble and re-brand pre-existing planning practices under the "sustainable" label. Trying to avoid many common urban sustainable planning techniques that were used in Dongtan, the Singaporean planning team first searched for new sustainable planning approaches and technologies to distinguish themselves. This proved to be relatively difficult. A new planning approach is hard to define, whereas new technologies are relatively more expensive and depart from the expectation that Tianjin will be a practical and affordable eco-city. So Singaporean planners resorted to more than 40 years of Singaporean urban planning practice, renaming their standard new town public housing planning "eco," for export to Chinese partners. Thus the aggregated planning method used in Singapore's high-rise public housing was introduced to Tianjin as an eco-city feature. Singapore's aggregate public housing planning scales up from smaller patches of land with high-rise residential towers, and aggregate several patches into a neighborhood, several neighborhoods to a district, and finally several districts into a city (Eng, 1986). Bing re-branded, this practice was brought to Tianjin in the form of eco-cells, eco-neighborhoods, and eco-districts (Figure 4.6). This re-branding also drew on Singaporean planners' claim that public housing increases social harmony and sustainability by mingling different racial/ethnicity groups and social economic backgrounds (World Bank, 2009). Although China doesn't have the racial and ethnicity issues that Singapore faces and only about 20% of Tianjin's housing units are assigned as public housing, Singapore's aggregated planning method has become reputable in China as a major approach to eco-city design.



Singapore new town public housing planning
Source: Surbana Consulting

Tianjin eco-city sustainable housing planning
Source: SSTECAC

Figure 4.6 Rebranding Singapore Public Housing Planning

This rebranding of standard planning approaches as "eco" is also seen in the planning of the eco-industrial park in Tianjin. Located in the northern part of the eco-city, the park is planned to host environmental-related light industries, software and pharmaceutical companies. Its spatial plans are very similar to Singapore's industrial parks: standardized, ready-built factories and offices, facing a main boulevard. In an interview with the chief planner of Tianjin Eco-City eco-industrial park, discussing her

planning visions, she drew an illustration for me and explained "it is basically the same as the planning I have done [in Singapore's other industrial parks]; we of course added more trees and green space for Tianjin."[78]

In short, the effort to "not look like Dongtan" conditioned Tianjin Eco-City's current planning and facilitated the rebranding of long-standing Singaporean planning practices as "eco." Indeed, since 2008 Singapore's Ministry of National Development and its subordinating Urban Redevelopment Authority have praised Tianjin Eco-City as a new Asian approach to eco-city planning in their internal Staff Seminar and special exhibition. Given Tianjin's model eco-city status, such old-wine-in-new-bottles Singaporean practices have re-defined the sustainable planning repertoire used in Chinese cities.

Rebranding old practices as "eco" also has returned to affect Singaporean's own urban projects. For example, a late 1996 public housing development built in Punggol satellite town in northeast Singapore was renamed "Punggol eco-town" in 2010 by the Housing and Development Board.[79] While being interviewed about how Tianjin Eco-City's development practice influence Singapore's own urban development, a government policy researcher who has been documenting eco-city development in both China and Singapore believes that the rename of Punggol is purposefully to create a

[78] Interview with SGJR02 in March, 2013.

[79] http://www.hdb.gov.sg/fi10/fi10296p.nsf/PressReleases/38ED16EFE18DDA8C482576B800265A27?OpenDocument

domestic example that can showcase Singaporean eco-city planning as Tianjin's construction expands.[80]

Punggol was again mentioned in several other interviews and conversations with planners and policy specialists involved in Tianjin Eco-City development in Jurong Consulting, Surbana Consulting, and Ministry of National Development. According to these planners and policy specialists, Tianjin Eco-City serves as a test-bed for Singapore's future urban development projects, especially framed as an experiment site for possible add-on green features to current public housing planning design, and newly built "urban sustainable living laboratory."[81]

4. Connections extending from London/Arup

After Arup joined the Dongtan project in late 2004, many Chinese cities also contacted Arup for consulting and planning contracts. Between 2005 and 2009, Arup signed agreements and developed main contracts with several other Chinese eco-city projects (Arup, 2009).[82] Some contracts asked for new eco-city designs, others for revising pre-existing urban sustainability master plans. The planning details of these projects are still under none-disclosure agreements, but there are some clues linking them with Dongtan. In interviews with Arup planners about how Dongtan informed their other projects, some noted that Dongtan's experience brought in business know-hows,

[80] Interview with SGOB01 in March, 2013.
[81] Interview with SGSB01 in March, 2013.
[82] Include Tangye, Wanzhuang, Huzhou, Zhujiajao, Changxin (Beijing), Zhenzhou, Tongshan, Chongqing, Wuxi, Changsha, Tianjin, Wuhan, Changchun, Qinddao, Zhuzhou.

including how to handle negotiation with local officials, local planning culture, as well as ways of coordination among staff in London office and those recruited in China.[83] Dongtan in fact set up a template for Arup in other Chinese eco-city projects and helped Arup get its foot into the door to China's eco-city construction fever.

Dongtan's practice also was brought to other projects' master planning. As of 2012, many employees working in Arup's urban planning branch in China were recruited between 2005 and 2006, during the Dongtan project; they continue to use the planning and business template set up for Dongtan in other projects. Projects conducted between 2005 and 2007 have identical planning procedures and features to Dongtan.[84] Arup also included Dongtan's full planning practices into its internal library, available to all employees across branches in all world regions; in 2008, Arup further produced planning guidelines on eco-cities informed by Dongtan's experience. Both are still used widely in Arup's workshops with new clients on sustainable projects.

Circulation of new planning technologies: SPeAR and IRM

Dongtan also influences Arup's other projects, in and outside China, through two planning tools in particular, refined for Dongtan. First is the SPeAR (Sustainable Project Appraisal Routine) (Figure 4.7), developed by Arup in 2000 based on UK Sustainable

[83] Interview with LNAP02 in December 2012.
[84] For example, a previous Arup planner discussed the Wanzhuang eco-city project, in contract with Arup since 2006: "Most people worked on the Wanzhuang eco-city also worked in Dongtan. The practices in Dongtan were replicated, although the two projects have very different conditions and contexts."(interview with LNAP01 in November 2012).

Development Indicators from "Quality of Life Counts," EU and UN sustainability indicator sets and the Global Reporting Initiative indicators. The SPeAR assessment tool was developed to help balance the many factors affecting a sustainable project, and to improve Arup's performance in delivering planning objectives (McGregor and Roberts, 2003; Arup, 2012). In order to better assess Dongtan's sustainable development results, the SPeAR was revised with additional sets of quantified social factors reflecting China's particular context, with the flexibility of including other relevant green building rating tools, such as LEED and BREEAM. These revisions enhanced the flexibility of SPeAR, satisfying international clients' specific needs; the revised SPeAR has been used in the bulk of Arup's sustainable planning projects.

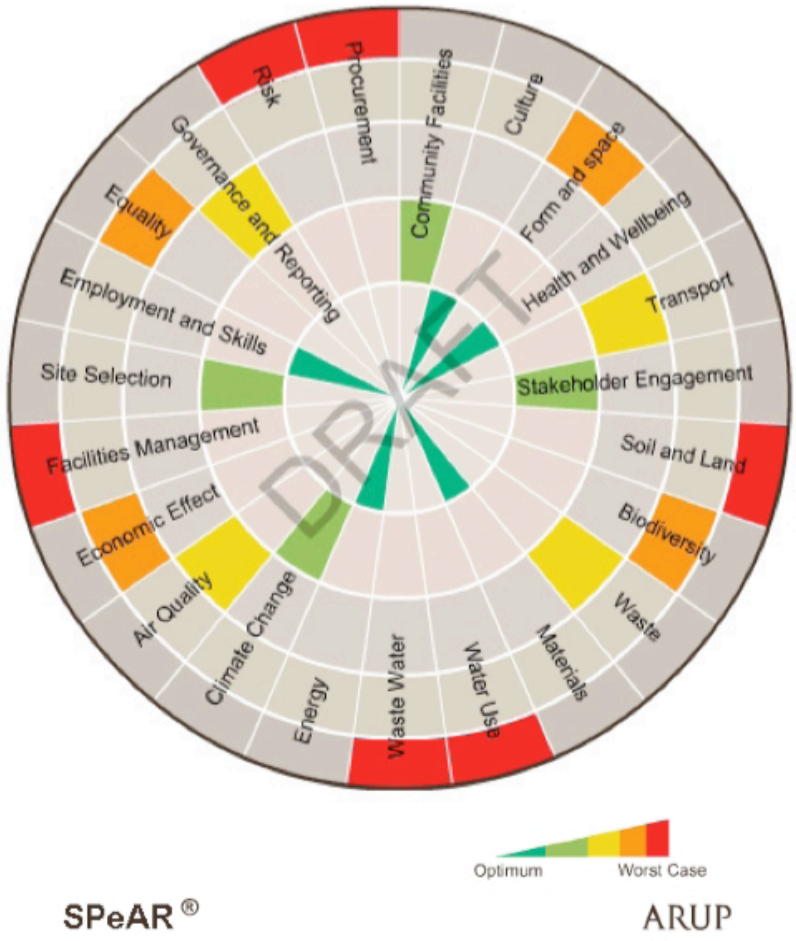
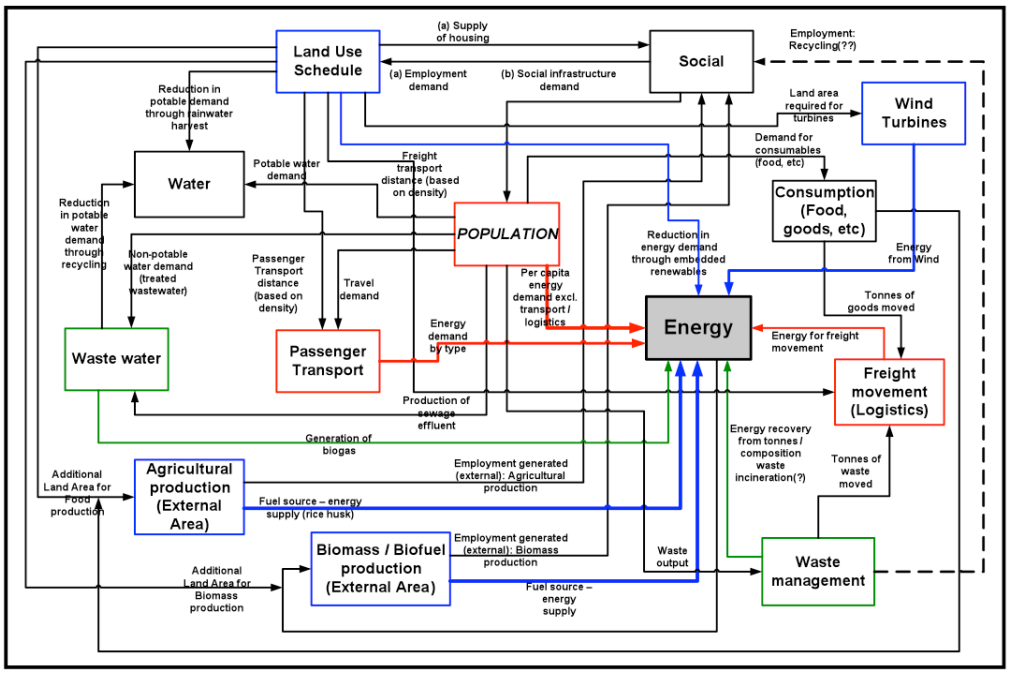


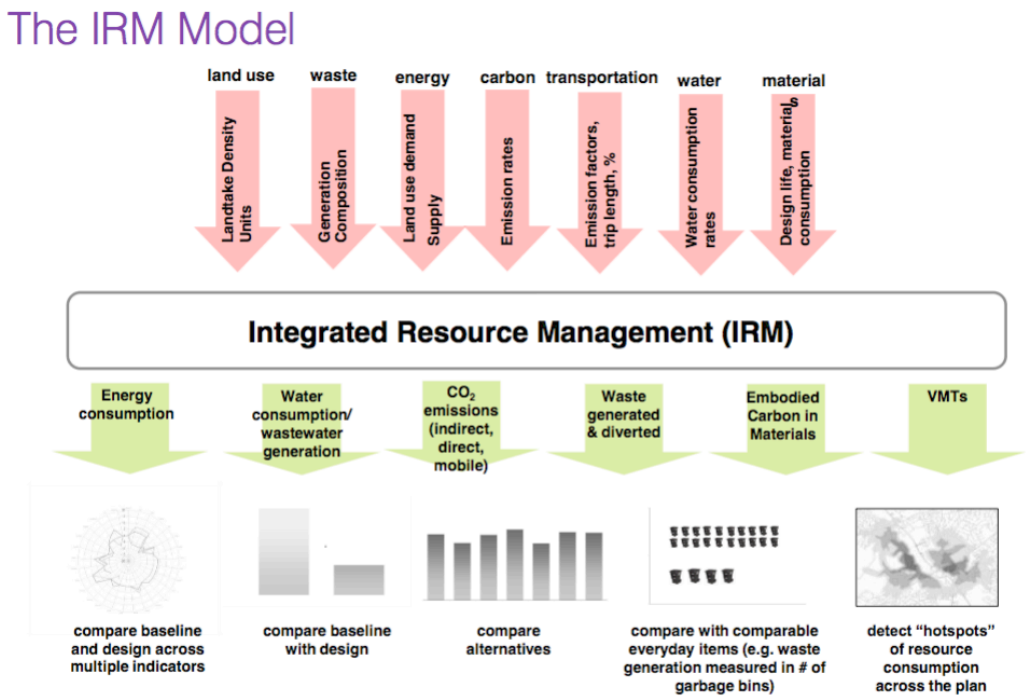
Figure 4.7 SPeAR
(Source: Arup. 2012. SPeAR Handbook 2012 External Version. London: Arup.)

The second tool, invented particularly for Dongtan, is the IRM (Integrated Resource Management) model, a software linked with GIS data, running calculations on various data input/output to generate different scenarios. Peter Head and his team members, based in London and New York, developed this software to realize his

integrated planning approach for Dongtan. It can incorporate data from urban design, socio-economic indicators, transportation, logistics, building design, energy supply and consumption, water system and waste management (Page et al, 2008). The most important contribution of IRM is to incorporate information from different urban planning sectors and experts and to provide a platform for communication. It facilitates coordination among different planning sectors, as experts can see how changes in design of one sector may affect other sectors and the final result (Figure 4.8). The IRM model can run various scenarios for clients to see how, and what kinds of, planning can achieve their quantified sustainable key performance indicators. With the development of IRM, Dongtan's urban planning moved away from the traditional planning process that centers around architectural planning or urban spatial planning, to a back-and-forth planning process that centers around input and output flows.



(Source: Page et al 2008. The Integrated Resource Management (IRM) model–a guidance tool for sustainable urban design.)



(Source: Roberts, C. 2010. Spatially-linked Integrated Resource Management (IRM): A tool to inform sustainable city planning, presentation at New Partners for Smart Growth, Seattle, WA, February 4.)

Figure 4.8 Integrated Resource Management Model

Since the development of IRM in 2005, Arup continues to market and circulate it, using media and various professional convention venues to advertise IRM, creating the narratives that eco-city integrated planning can only be done through a comprehensive calculation on input and output data. Arup also created a new holistic planning and consulting service package for clients comprising both IRM and SPeAR, along with a set of co-city planning guidelines Arup developed informed by Dongtan's experience.[85] Given SPeAR and IRM's capacity in running various scenarios, Arup now advertises this package as a unique planning tool that can help clients either develop a sustainable city with material flows integrated with the local eco-system, or plan a sustainable city based on pre-given quantified Key Performance Indicators (KPIs). The latter function supposedly guarantees that a new sustainability plan will fit perfectly into multiple urban sustainability accreditation systems at different scales, from green buildings ranking systems to citywide sustainability performance requirements, and any national regulatory schemes. The new integrated package has become popular. In addition to Arup's subsequent projects in China, after 2007 IRM model also had been applied to projects in the UK, such as the Northstowe eco-town (Cambridge) and Ebbsfleet Valley (Kent). It also has been used in other world regions and shared with the Clinton Climate Initiative C40 network to help participant cities develop eco-city plans.[86]

[85] Interview with LNAP01 in November 2012; LNAP02 in December 2012.
[86] Interview with LNAP01 in November 2012.

New networks: EPSRC research network and departing planners

As part of the memorandum of understanding governing Dongtan's development, Dongtan project also is expected to be an urban experiment site, where research institutions and universities in the UK and China collaborate to explore new sustainable solutions. Based on that agreement, as well as Arup's intention to broaden its collaboration with research institutions, Arup's Global Research department director Jeremy Watson since 2006 had contacted relevant research experts in University College London, University of Southampton, and Imperial College in the UK, and Tongji University, Peking University and Tsinghua University, and relevant government planning agencies in China. Together, they formed the Dongtan Eco-City research network in 2007, funded by the UK Engineering and Physical Science Research Council (EPSRC). In December 2007 and October 2008 the research network held one workshop in London and another in Shanghai, and formed three research groups focusing on sustainable planning, technologies, and business strategies in relation to Dongtan.[87] Building on these collaborations, there have been frequent individual invitations between Chinese and British members to conferences and workshops in each other's countries between 2008 and 2010.

Yet the three research groups and the network did not proceed well. With Dongtan suspended, the interests in Dongtan decreased. The EPSRC only supported

[87] They are groups of "city history and multi-scale spatial master planning," "sustainable economic and ecological models of peripheral urban functional units," and "sustainable urban systems to transfer achievable implementation."

networking expenses among Chinese and British members but not actual research.[88] The original presumption was that future research funding would come from other Chinese and UK agencies, but no such funding was forthcoming in 2010.

But even though the EPSRC research network fell apart, other networks built since late 2007 continue to be influential in sustainable knowledge transfer and collaboration. Through the research project team based at Imperial College, "ecocit," team members were invited by Bluepath to work at Tianjin Eco-City, helping Tianjin set up its first International Eco-city Binhai Forum and publish a white book on Tianjin Eco-City's index system.[89] Members in the other two projects also were invited to participate in Tianjin Eco-City related consulting projects that were subcontracted to local universities, and in eco-city projects in other Chinese cities; some of the knowledge generated through the Dongtan research network spread further within China.[90]

After Dongtan was suspended, some planners in the Arup Dongtan team left, especially leading planners who were hired particularly for building the first eco-city. Utilizing their Dongtan experience, most departing planners continue to work inside the sustainable planning profession, becoming pioneer eco-city planners. Shanfeng Dong and Peter Head are particularly influential. As mentioned, Shanfeng Dong established the consulting company Bluepath, now one of the most prominent Chinese domestic eco-city planning consultancies. Peter Head established the Ecological Sequestration Trust, through which he continues delivering consulting services based on the IRM model he

[88] Interview with LNUL01, LNUL02, LNUL03 in November 2012.
[89] Interview with LNBP01 in January 2013. Also see ecocit's website: http://wwwf.imperial.ac.uk/business-school/research/innovation-and-entrepreneurship/ie-research/recent-projects-and-centres/ecocit/outcomes/
[90] Interview with LNUL01, LNUL02, LNUL03 in November 2012; LNBP01 in January 2013.

developed. He is currently providing consulting services to Tianjin Eco-City, Chongming Eco-Island, and a handful of other Chinese cities.[91] Surat, India, also has contacted him for consulting services, seeking to draw on his experience in Dongtan and Chongming to build India's first eco-city.

5. Connections extending from Tianjin

Tianjin Eco-City is also extending its own connections through various venues. As part of the know-how that Tianjin planners and policy makers acquired from Dongtan Eco-City, the Sino-Singapore Tianjin Eco-City Administrative Committee (SSETCAC, the eco-city's actual governing body) strives to advance its presence in media, professional networks, and academia. Journalists from major international and domestic media, eco-city activists, and prestigious researchers on urban sustainability and environmental planning have been invited to Tianjin for on-site visits. Richard Register, a regular invitee, reports on his activities in China in newsletters of his think tank, *Ecocity Builders*. At the 2013 International Eco-city Summit in Nantes, he described Tianjin as a best practice model. SSETCAC also has sent the eco-city's master plan for comments to major international organizations, including the World Bank, UN Habitat, UNESCO, ICLEI, and WWF, also inviting their urban sustainability program directors to visit Tianjin Eco-City.[92] Activists, researchers and professionals are especially invited to China's international eco-city conference, Binhai Forum, hosted every September by

[91] Interview with Peter Head in November, 2011.
[92] Interview with TJEC02 and TJEC03 in September 2011; WB01 in December 2012.

Tianjin Eco-City as its major effort to broadcast its planning and implementation practices. Tianjin Eco-City also seeks active connections with other iconic sustainable cities around the world, regularly arranging international study trips for their planners to those cities (e.g., Berkeley, Ithaca and Freiburg).

Planners in SSETCAC and Bluepath also actively promote Tianjin's sustainable guidelines and KPIs through publication. With more than 230 eco-cities under construction, China still has no standardized construction guidelines and KPIs for eco-city development[93]. Seeking to grasp this opportunity, since 2010, SSTECAC has actively published detailed reports, white books and other educational booklets to advertise its own KPI and indicator system. Its *Navigating The Eco-city* (2010) has been particularly influential among urban planners. Some of the higher ranked officials in SSTECAC and Binhai New Area also leverage their personal networks to gain support for its KPIs from the Ministry of Housing and Rural-Urban Development, and the Ministry of Environment Protection. These officials of SSTECAC deliberately subcontracted relevant research projects to influential scholars in Beijing, as another way to gain endorsement from the Ministry of Housing and Rural-Urban Development, and the Ministry of Environment Protection.[94] These scholars, mainly with prior experience working at both Ministries and now based in the China Academy of Urban Planning and Design, Peking University, Tsinghua University and Chinese Society for Urban Studies, also hold multiple consulting contracts with other Chinese eco-cities.

[93] There are two sets of threshold indicators, published by the Ministry of Housing and Rural-Urban Development, and the Ministry of Environment Protection, but they serve more as a framework for accreditation of eco-city status.
[94] Interview with BJOB01 in October 2011; UKOB01 in September 2011 and November 2012.

Requests for on-site visits to Tianjin increased after the publication of *Navigating The Eco-city*. A receptionist at Tianjin Eco-City estimates that a large group (10-20 people), as well as two to three small groups (5 or less) visits almost every week. These visits also include delegates from the UK-China Eco-city and Green Building Group in September 2011, and 18 US mayors from the US-China Eco-city program led by the Department of Energy and Department of Trade and Industry in December 2011.[95] Mayors from Tianjin's sister cities (Melbourne, Australia and Philadelphia, US) also have visited, signing memorandum of understanding for collaboration on eco-city development. Connections occur in many other ways: major planners working in the eco-city regularly receive email inquiries about eco-city planning, mostly from other Chinese planners who they don't know in person. There are also frequent phone calls, interview invitation for media coverage as well as research interview requests.

6. Connections extending from Singapore

Singapore government and planners also contribute to the circulation of Tianjin Eco-City's planning model and practice. Tianjin Eco-City helps the Singapore government rebrand its public housing as eco-city development also in other countries. Thus its Center for Livable Cities, a government research and education center responsible for all sustainable city relevant conferences and workshops, takes on the narrative of public housing as an eco-city planning approach in various venues, including

[95] http://www.ase.org/resources/china-and-us-becoming-more-sustainable-energy-efficiency

a series of sustainable city lectures held throughout 2013. URA and HDB also used this narrative in their special exhibition on eco-city in December 2012 and booklets.

The Singapore government also includes Singapore's public housing and Tianjin Eco-City's planning in the Mayors Program, a training program designed particularly for Chinese local government leaders, hosted by Nanyang Technological University. In a regular teaching trip to the URA urban development museum, the lecturer introduced the Singapore public housing planning as a major eco-city development principle.

> "Public housing is very sustainable. I know you don't have racial problems [in China], but don't forget it can also create high-density living. It can make land use more efficient… Because the design of public housing is very simple, planners only need to replicate the city blocks to achieve the desired scale; you can build a sustainable city very fast and cheap, without being worried about not able to complete [the project]."[96]

In addition to Mayor's program, URA and HDB also market its Tianjin Eco-City experience back in China through hosting sporadic events. For example, when MND invited provincial level Chinese government leaders to Singapore in early 2013 for an educational workshop, Tianjin Eco-City again was presented as an eco-city development template.[97]

Since the Tianjin Eco-City collaboration, the Singapore government signed a further sustainable urban development collaboration contract with Chinese government:

[96] March 7, 2013 at URA planning hall.
[97] Interview with SGLV02 in March 2013.

the Sino-Singapore Guangzhou Knowledge City. Based on Tianjin Eco-City's experience, the knowledge city is portrayed as an eco-city equipped with most advanced ICT technologies and digital infrastructures: a green and smart city. The knowledge city adopts Tianjin Eco-City's organizational and financial arrangement frameworks, setting up governing and investment consortiums. Many Singaporean planners and officials involved in the earlier stage of Tianjin Eco-City now also work on Guangzhou knowledge city. Several high ranked officials, formerly employed in Tianjin investment company, have moved to semi-governmental or private sector organizations that are now the main investment partners in the knowledge city, and in other Singaporean investments in China. For example, a particular influential figure is Mr. Lim Chin Chong. Previously the Deputy CEO of Sino-Singapore Tianjin Eco-City Investment and Development Company before 2011, he now serves as the CEO at Sinbridge, the major investor in Guangzhou knowledge city.

As Tianjin Eco-City successfully rebrands Singaporean public housing planning and industrial park planning as eco-city planning, implicated semi-governmental planning firms such as Surbana consulting and Jurong consulting also advertise their planning practices internationally. With the advantage of participating in Tianjin Eco-City planning, Surbana has successfully signed several international residential development projects using a master plan concept similar to that of Tianjin Eco-City, in UAE, Qatar, Nigeria, South Africa, Rwanda, Vietnam, Mumbai, as well as China (Rizhou, Nanjing, and Chengdu) (Surbana, 2013). Jurong has signed eco-industrial park development

projects in Shenzhen and Dalian, which draw on their experience in implementing Tianjin's eco-industrial park.[98]

7. Discussion and conclusion

Contemporary city-making involves unprecedentedly diverse actors, agents and activities in networks that extend globally, shuttling ideas rapidly across places, also (re)shaping the ideas on the move. Cities are thereby constituted through their relations with other places and across scales (Massey, 2005; McCann and Ward, 2010; 2011a; 2011b; 2012a; 2012b). In this chapter, I show how eco-urbanism in China is embedded and constituted in such a global network of city building. The professional epistemic communities, traveling technocrats and transnational consultancies continuously carry eco-urbanism ideas among London, Shanghai, Tianjin, and Singapore, but also actively disseminate the ideas to other places (Figure 4.9). These actors, and the ideas they carry, do not travel in a vacuum, but act through complicated national and local contexts that constantly amend actors' rationales and the ideas themselves. In the process, different technologies are assembled and reassembled, dynamically creating the current eco-city model in China. As I have shown, this is a dynamic globalizing process weaving together multi-scalar forces with the "politics of elsewhere."

[98] Interview with SGJR02 in March 2013.

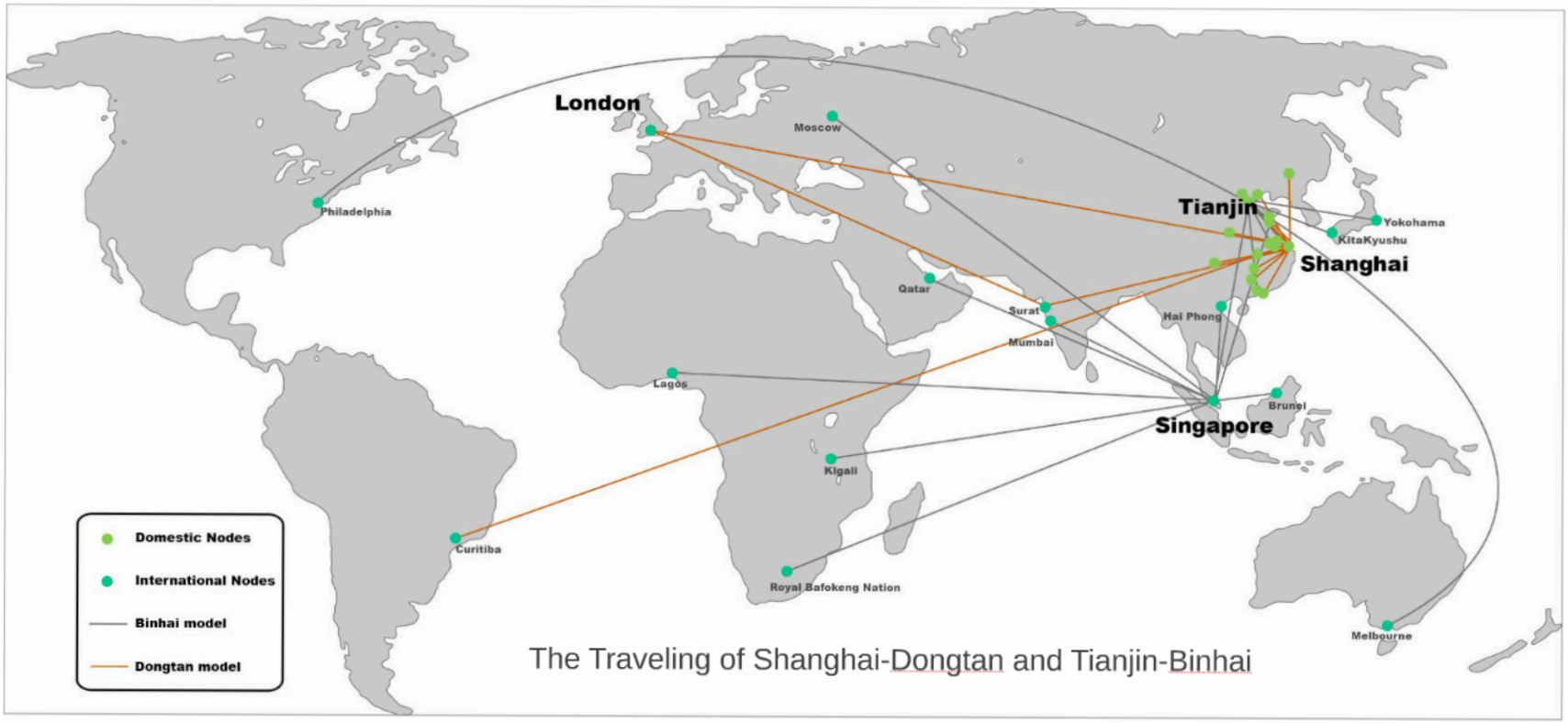


Figure 4.9 The Traveling Paths of Dongtan Eco-City and Tianjin Eco-City
(prepared by author)

Informed by the literature of policy assemblage, mobility and mutation, I trace this globalizing process, examining the social and material connections coming in and extending from Dongtan and Tianjin Eco-Cities. The intricacies depicted here seek to enrich our understanding of urban policy assemblage, mobility and mutation, as well as to highlight understudied planning process in globalizing China. I draw three conclusions, each bringing different aspects of Chinese eco-city experience into conversation with the literature on mobile urbanism.

First, the role of Dongtan in shaping successive Chinese eco-urban experiments, and its influence over the sustainable planning industry, pushes us re-contemplate the role of unsuccessful projects in policy assemblage, mobility and mutation. The back and forth planning procedures and technologies refined and developed for Dongtan (SPeAR and IRM) have gradually reformed planning routines throughout Chinese sustainable urban development. This is particularly important for China's urbanization, given that its recently published new urbanization policy pledges that all new cities will be green and eco-friendly.[99] Through Arup's involvement, a new planning paradigm has been adopted while professional expertise for eco-city planning in China has also advanced and been bridged with international sustainable planning networks. Peter Head's IRM model challenges the dominant role of master planning in China's top-down urban planning system, contesting its linear workflow. As a result, master planning has been de-centralized into dialectical relationship between material flows and control and site construction plans. This actually weakens municipalities' discretionary power in deciding

[99] http://www.gov.cn/xinwen/2014-03/16/content_2639841.htm

land use simply based on development intentions. Confirming with McFarlane (2011b)'s argument that failed projects may build capacity of engagement through new relationships and new working habits, Dongtan's influence altered the planning paradigm and reorganized the relationships among different phases of urban planning, i.e. the context in which eco-cities operate. However, there is no evidence suggesting that the failure of Dongtan resulted in redoubled efforts to promote its particular model, as Peck (2011) describes with respect to neoliberal policy transfer. One possible reason is that defining eco-urbanism is elusive with no one single model; therefore, there is no prototype for redoubled reform to anchor onto.

But China's national governmental effort to promoting eco-cities in general, as part of domestic urbanization policy, has not been attenuated by Dongtan's unsuccessful implementation. Instead, the failed Dongtan lived on as a reference point for planning the new national exemplar, Tianjin Eco-City. The intention that Tianjin not to look like Dongtan, to avoid association with a failed project, in fact shaped the search for a new eco-city model. This contrarian stance shaped how Singaporean planners rebranded high-rise public housing blocks as a signature aspect of Tianjin Eco-City, converting them into an ideal eco-urbanism idea for policy transfer. Residential blocks can be easily de-territorialized and re-territorialized, as they are not particularly tied to local eco-systems and are scalable: they can be aggregated to any city size, depending on clients' needs. Singaporean planners have taken advantage of this, circulating the 'eco-cell' model to other Chinese cities and cities in other world regions.

SPeAR and IRM act in a similar manner, mutating into a software bundle for planning assessments and scenarios simulations, based on input and output material flows, to help new urban plans either fit with local eco-systems or meet multiple quantitative indicators and urban sustainability accreditation systems at different scales. SPeAR and IRM have been de-territorialized from Dongtan, and rendered the mobility to travel elsewhere.

Second, I find that following the mobile actors is as important as following urbanism models, to understand policy assemblage, mobility and mutation. When tracing the genealogical connections of Chinese eco-urbanism models and their trans-local relations, I show that the models mainly travel with actors, in study trips and trips to conferences and workshops, moving through the professional networks of urban sustainability planning experts extending between Shanghai, Tianjin, London and Singapore, and beyond. Moving with and being constantly interpreted and re-interpreted by various actors, these models are (re)assembled and mutate, shaped by actors' context-specific considerations. This suggests several meaningful research agenda that has not been well explored in the literature of policy assemblage, mobility and mutation, especially in Chinese context. On the one hand, study trips and sister forms of "policy tourism" deserve further investigation. When urban policy makers and planners travel, to acquire first-hand information about the development of different urbanism practices, they are involved in power-laden relations (Cook and Ward, 2011; Temenos and McCann, 2013). Who is invited for which study trip? What is made visible to them? What is presented as best practice? All these related visiting activities and presenting

materials are selectively arranged and packaged by the organizers, for specific purposes that influence what is prioritized in the mobile eco-urbanism models.

On the other hand, it is also important to understand how policy makers and planners perceive best practice models. As argued by McCann (2013) in his study of urban boosterism through Vancouverism, policy makers and planners' "mental maps" of exemplars are important for understanding the global-relational urbanization process. Their mental maps of where to visit and what to learn are not only conditioned by the institutional culture and infrastructures that facilitate trans-local learning, but also by the "micro-spaces" and mundane practices of their daily practices (Prince, 2012). Policy makers and planners constantly evoke connections and comparisons among cities when crafting urban landscape, assembling and re-assembling best practices, for being translated into their own cities from far away. Particularly when the connections and comparisons across global South-North, East-West divides, the inter-referencing of urbanism ideas is always a process of negotiation between different urban imaginaries and realities (cf. Roy 2011; Roy and Ong, 2011), as evident in China's search for national eco-city exemplars. More detailed investigation of policy tourism and key actors' micro spaces in the proliferation and globalization of Chinese eco-city models is certainly needed.

Finally, it is important to acknowledge the limitations of studies on policy assemblage, mobility and mutation. This involves "studying through" the connections between actors, traveling agents, policies and places (McCann and Ward, 2012a; 2012b). Researchers generally find themselves moving with and after actors and policies, through

the web of social and material relations connecting them. But such research activities always are constrained by time, available funds, and researchers' personal social capital. Meanwhile, policy assemblage, mobility and mutation is always in a dynamic process of "coming together and being territorialized, as well as potentially pulling apart and being de-territorialized" (MacCann and Ward, 2012b: 328). Policy and urbanism models constantly mutate and transform in their journeys from place to place, remaking relational connections across an intensely variegated, shifting social-institutional landscape (Peck, 2011, 793). It is simply not possible to fully map all these traveling and mutating trajectories, implying that researchers need to acknowledge how his or her work is only a partial "commodity chain" of an urbanism model or policy, under a specific spatiality and temporarality. This is what I present here. The connections I depict constitute an incomplete map of Dongtan and Tianjin's trans-local relations from 2004 to 2013; and these relations are constantly evolving and open to new interpretations.

Evan an incomplete map of urban connections can bring important insights, however. While seeing cities as sites constituted by the relations coming through them, we are seeing cities, as well as urbanism models and policies, as heterogeneous associations held together by both diverse actors, urban technologies, and other social and material relations (Murdoch, 1997). What is important here is not how complete our stories about urbanism are. As Latour (2005) argues, it is how the connections are held together, and how they break apart; in other worlds, how urbanism models are generated and transferred. Eco-urbanism is never just a technical sustainable development model. As I have shown, it is a set of urban practices intertwined in a globalizing urban making

process, conditioned by China's specific planning regime, and reassembled and rebranded through a specific spatiality and temporality.

CHAPTER FIVE

Conclusion:

Can Eco-Cities Bring About a More Sustainable Future?

It has been a decade since China's first eco-city project at Dongtan was officially launched in 2005. This moment marked the beginning of a decade-long and still on-going experiment of transferring an ecological urbanization model with North American and Western European roots to China. My three chapters sought to understand the processes and implications of this undertaking by studying the two flagship eco-city projects that are emblematic of the Middle Kingdom's recent search for a transformative urban model. Through a relational approach and multi-scalar analyses, I uncover the paradigmatic shift in China's eco-city development from the first but abortive Dongtan Eco-City to the current national exemplar in Tianjin Eco-City. Furthermore, I demonstrate how this eco-city development in China anchored competing visions of urbanism, reforms in planning and governing institutions, and broader political and economic agendas.

In this concluding chapter, I seek to accomplish two goals. First, I would like to discuss what the knowledge from studying Chinese eco-city development covered in the earlier three chapters entails for other places. As the reasoning based on my research findings will show, the Chinese ecological urbanization project can be connected to other

cities in the global South through shared challenges, perceived similarities, and mutual ties with international actors. Second, I intend to draw from my continuing observation of Chinese eco-city development, discussing the implications of ecological urbanization agenda and identifying future research directions.

1. Implication for the rapidly urbanizing global South

The development of Dongtan and Tianjin Eco-Cities are embedded in China's distinct political economic structure and the associated international professional planning networks. Still, other societies in the global South often share issues China's eco-city development has sought to address. Chapter two and three identify China's tripartite challenges in managing population flows amidst rapid urbanization, maintaining sustained growth in a manufacture-based economy, and confronting widespread environmental degradation. One or more of these conditions can and have occurred in many other fast growing economies, where managing mega-city, pollution and environmental degradation are immediate tasks for both local and national governments to respond in order to maintain their governing legitimacy (Hardoy et al, 1999; Jellinek, 2000; Kumar and Krishan, 2000; Markowski and Rouba, 2000). Particularly after the Agenda 21 that formed international consensus on "think globally, act locally" for protecting the shared only one earth, state and local governments have been urged to take stricter measures on environmental governance by supranational organizations (Bulkeley, 2005). Meanwhile, in order to continue economic growth, local and national governments

also confront challenges of revitalizing brownfields and searching for new urban economic strategies, while managing urban/rural tensions.

In the Chinese context, eco-cities have been presented as the cure-all to resolve these challenges. Economically, newly built eco-cities can generate construction demand and create new real estate markets to make up for sluggish growth in manufacturing, especially after the 2008 recession. The projects were also designed to accommodate rural migrants and the expanding middle class, and facilitate the transition into a consumer-based economy. As far as population management is concerned, the suburb locations of new eco-cities were chosen to spatially ease hyper-populated cities. Ecologically, green features such urban farming and restoration of wasteland promised food security, a peaceful co-existence between urban development and land conservation, and the revitalization of brownfields in underperforming industrial sites. Following this logic, eco-cities are presented as an ideal development model for places sharing the major challenges that China encountered in the early twenty-first century.

In addition to potentially resolving shared challenges, Chinese eco-city development is also linked to cities in the global South in more substantial ways. In chapter four, I documented how the circulation of eco-city models of Dongtan and Tianjin has mostly taken place in the global South. Anecdotal evidence suggests that this pattern is likely the result of perceived similarities that drive developing economies to view China as a model to emulate. The leading sustainable planner Peter Head, for example, described that his clients from Surat, India were particularly interested in what had worked in China because they believe India and China face similar urban issues. The

Surbana Consulting and Jurong Consulting (Singapore) have also been marketing their planning models to Africa, South Asia, and Southeast Asia, using the reasoning that a design working in the most populated and heavily polluted China can surely work elsewhere. While more observation to understand this on-going trend is needed, so far it appears that the spread of China's eco-city models to the global South is enabled by perceived similarities that make China the reference point. This perception is further reinforced and capitalized on by international planning professionals and organizations, actively promoting the Chinese experience.

2. The implications of eco-city construction

After a decade of China's eco-city construction fever and with the broad trans-local circulation of Chinese eco-city models, there is an emerging question that needs attention and also further research: what are the implications of eco-city development in China and beyond? This question entails close examination of the social, environmental, and economic impacts of eco-cities on urban living. To date, I have not seen a study that properly examines the implications of ecological urbanization. Although my previous three chapters do not answer this question, I would like to reflect on the implications, and conclude my dissertation research by drawing insights from other urban development experiences (new town development, urban sustainability design and urban mega-projects) and identifying future research agendas on eco-city studies.

Social sustainability?

During the fieldtrip of the Second Binhai Forum organized by Tianjin Eco-City in September 2011, I talked to a graduate student from a local university. Her parents lived in an old town center in the nearby Hangu area. I was interested about her local perspective on the eco-city project. "Would your family like to move in to here?" I asked. "Of course we want to! But we can't afford to move here. My parents don't earn enough." Her father worked in an elementary school, and her mother held a part-time job in a local grocery store. In her words, they are just an "ordinary" family.

Another "ordinary" person I met that afternoon told me a similar story. After the conference field trip, I took a taxi to explore the area surrounding the eco-city. The taxi driver was friendly and talkative, in his mid-30s and lived in the nearby Tonggu area—he could not afford living in the eco-city. He told me how excited he had been several years ago when Tianjin Eco-City was first announced. "I thought it [the eco-city] would bring us many decent jobs, a lot of people, and a place that allows me to escape from the crowded street blocks in Tonggu. But I learned over these years that those companies [in the eco-city] only want people who can use computers, do complicated things. Those are things I can't do." He talked as if he would not qualify to live in the eco-city. But if an average local person like him was not qualified, most Tianjin residents also would not. Tianjin Eco-City aims to create employment opportunities in software, green technologies and pharmaceutical industries. But in an area dominated by blue-collar workers, how many can really benefit from the high-end jobs?

As we drove away from the eco-city, I started to notice there were some two-story high temporary, prefabricated housing units on both sides of the street. These units were very small and surrounded only by yellow dust. I asked the driver whom these housing units were for. "They are for migrant workers who came here and worked on the eco-city construction." This is the type of place where people who are building the eco-city lives. And we both knew that these migrant workers, along with their temporary housing, would disappear once the eco-city is completed. Those who built the city will not be able to stay in the city.

-- Revised from my field note on September 27, 2011

Many studies argue that sustainable urban projects create new urban enclaves (Hodson and Simon, 2009; 2010). While in theory green urban designs make places better for all, the outcome in practice is often not. The two Chinese eco-cities in my research have been criticized for building residential enclaves with greener streets, fresher air and bluer sky available only to middle-class and international elites. In the case of Dongtan, thousands of poor and less educated villagers were, or had been slated to be, displaced from the project site. For Tianjin, the majority of the "ordinary" residents living in the vicinity will never be able to afford the new apartments in the eco-city. Overall, the displacement of original residents and the creation of rather exclusive communities are largely neglected in China's march towards ecological urbanization and green economy. There is clearly a need to trace and document the life transitions of relocated and gentrified residents, study the potential contestations of and resistance against eco-urban/economic changes.

It is hard to fully assess whether Chinese eco-cities have lived up to their initial promises because most have not fully materialized. Nevertheless, we may gather some clues from Tianjin Eco-City. Although chapter three describes it as a "ghost city" with no active residents, since 2012 Tianjin Eco-City has made several attempts to increase its occupancy, most noticeably by encouraging, both materially and verbally, employees of the Sino-Singapore Tianjin Eco-City Administrative Committee (SSTECAC) and the Sino-Singapore Tianjin Eco-City Investment and Development Corporation to move their families into the community. Meanwhile, the SSTECAC also promoted a new income tax

deduction initiative to attract professionals and high-income executives.[100] According to the policy, those who purchase a condo in the eco-city can have all of their income tax during the year of transaction returned. The real estate companies, on the other hand, have lowered their asking price from the original range of 12,000 to 16,000 RMB per square meter to the current range of 8,500 to 14,000 RMB. Other incentives the SSTECAC is now promoting include free 12-year education, free hospital visits, and free public transportation for life. But as of early 2014, none of the schools and hospitals were completed, and there were only four bus routes running under very low frequency; the eco-city's light rail system and a connecting subway line to the Tianjin city center only existed on the master plan.

Tianjin Eco-City is continuing its effort to attract businesses with the hope that new companies will help boost its residential population. In early 2014, there are about 12 completed properties in the start-up area and several office buildings are open for use. The eco-city subsidizes companies to hire professionals and executives, at a rate of 10,000 RMB for each hire. By the end of 2013, there are approximately a thousand companies registered in the eco-city, but most of them are small businesses, providing very limited numbers of jobs. In addition, some of the registered companies do not have a physical office on site.

With all these efforts, Tianjin Eco-City is no longer the ghost city that I first saw in 2011. By 2013, Tianjin Eco-City had about 2,000 households, with approximately

[100] Details of the "Sino-Singapore Tianjin Eco-City Policy Incentives for Recruiting Special Talent (*zhōng xīn tiān jīn shēng tài chéng yǐn jìn jǐn quē rén cái de yōu huì zhèng cè yì jiàn*)" are available at http://www.eco-city.gov.cn/eco/html/zwzc/zcfg/20121130/8256.html

4,000 people registered as residents. However, many of these residents don't actually live in the eco-city; some apartments are only bought for investment purposes. Even if all of the 4,000 residents live on-site, the number is still far below the projected goal of 85,000 residents for the first phase development. Meanwhile, the more than 6,000 migrant workers coming into the eco-city for construction still return to their temporary housing units outside eco-city at the end of every day.

Life for the small number of residents living in the eco-city also remains far from the original plan. A glimpse of the current living conditions can be found in a jingling rhymes circulating among the residents since early 2013: "[We] get around by walking, see doctors on *Baidu*,[101] spend the weekends on the couch, and enjoy our vacations on the internet (*chū mén kào bù xing, kàn bìng kào bǎi dù, liù rì kào shā fā, jiǎ qī kào wǎng luò*)." This joke vividly portrays the current issues for Tianjin Eco-City: low population density, and the lack of transportation options, medical services and entertainment. And in no ways this new-town life seems sustainable to current residents. While the "ordinary" people complaint about not able to move into the eco-city, the current residents are now thinking of moving back to the Tianjin city center to re-embrace a more vibrant urban life.

One useful approach to evaluate these issues at Tianjin Eco-City is to look into research of the new town movement that occurred in many countries and can be traced back to the early 20th century England. Closely related with the Garden City movement, the New Town movement over the last century was an effort to both enable planned

[101] *Baidu* is the most popular Internet search engine in China.

suburbanization and create utopian shelters for those who seek to escape unpleasant and congested city centers (Orlan, 1952; 2013). Since 1970s, new town constructions began emerging in many Asian cities as the means to provide public housing, relocate slums, stimulate the domestic housing market, balance regional development, and suburbanize residents away from mega-cities (Padawangi, 2010; Wang et al, 2010; Joo, 2013). The driving forces behind many Chinese eco-cities resemble that of new town constructions; both Dongtan and Tianjin Eco-Cities can also be seen as part of this new town development vogue.

Previous new town developments have diverse outcomes (Department for Communities and Local Government, 2006; Joo, 2013). For new towns far away from old cities and in short supply of amenities, a common challenge has been to attract enough residents. In comparison, new towns with desired and self-sufficient features could also turn into high-end enclaves segregated from the pre-existing urban fabric. New town construction in China has also showed similar patterns. For example, the well-studied "one city nine towns" project in Shanghai featuring satellite towns with distinct architectural designs outside Shanghai have been documented with both types of the problems (Shen and Wu, 2011; Wang et al, 2010). Many of these new towns are too far away from city center with limited transportation to urban facilities, which has kept the occupancy low. Nevertheless, the coveted green field sites, the better construction quality, and the architectural designs still attracted buyers who can either afford long commute by cars or use them as a second home for weekends and holidays. The

combination of these two trends has transformed what were intended to be populated satellite towns into exclusive high-end communities.

While it is still early to conclude that Chinese eco-cities will end up like previous new town developments in China, the current trend offers little comfort to those who expect otherwise. Generally, the housing units in eco-cities may sell, but they mainly go to the more privileged. In her observation on Huangbaiyu eco-village and the early stages of Dongtan and other green urban projects across China, May notes that as Chinese cities continue to expand, "the residents of these newly urbanized areas will not be newly urbanized persons but, rather, are already well-off residents shifting residence" (2011: 103). Since 2010, however, Chinese central government has started tightening regulations on property ownership as the means to contain speculation in the housing market while also encouraging local governments to provide affordable housing units in newly built cities with low occupancy rate. The new regulation, coupled with a tightened domestic credit market, appears to have reduced the housing price in Tianjin Eco-City. With more affordable housing becoming available in 2014, there is still hope for Tianjin Eco-City to become a more egalitarian and socially sustainable community.

Ecological sustainability: designs on density

The shift from Dongtan Eco-City to Tianjin Eco-City also marks a change in the understanding of environmental sustainability that has broad policy implications. As my research has shown, Dongtan Eco-City adopted a sustainability model based on the

carrying capacity of the natural environment: a low-density urban design, producing smaller ecological footprints and integrated into the local ecosystem. In contrast, Tianjin Eco-City features a high-rise, high-density design in an artificial environment, with no particular emphasis on the ecological footprints or the carrying capacity of the natural condition. While this change was embedded in China's particular political and economic context, these two different planning principles allude to a wider debate on cities and the environment, centered on the issue of urban density.

In his influential piece on ecological footprints and carrying capacity, Williams Rees proposes to conceptualize the city as "a node of pure consumption existing parasitically on an extensive external resource base" (1992:128). This understanding of the city prompted planners and policy makers to debate over the most optimal urban designs from a resource efficiency perspective. Those who adhered to the bioregionalism tradition argue that small scale, low density communities fit into minimally altered natural settings are more sustainable than large, high density cities that supposedly put an enormous strain on their regional environment (cf. Roberson, 1990; Clark et al, 1993). In comparison, the opposite camp maintains that high density urban designs are more efficient because they achieve the necessary economies of scale to develop public transportation, reduce car dependency, and lower the average cost of service provision (Rees and Wackernagel, 1996; UN Centre for Human Settlements. 1996). Since the 1980s, the "compact city" movement in Europe and the similar "smart growth" and "new urbanism" movement in North America have sought to combat urban sprawl by promoting denser forms of urban development. While urban density is evidently a

complex concept, interacting with issues of urban size, the planning literature clearly links urban density to environmental sustainability (Frey, 1999; Jabareen, 2006). Some go as far to claim that, "sustainable cities are a matter of density" (Carl 2000, cited from Jabareen, 2006: 41).

This general debate on urban density has its parallel in the urbanization policies in China. A noticeable proponent of low-density development is the municipal government of Shanghai, which has embarked on the "Double Increase and Double Decrease"[102] campaign since 2003 to create a more sustainable and livable city. The most prominent objectives of the policy are to increase green and open space in the city and lower the average building density and height. This policy has also led to Shanghai's suburbanization plans including the above-mentioned prominent "one city nine towns" project (Wang et al, 2010) as well as Dongtan Eco-City (Shen and Wu, 2011). In contrast, the central government has proclaimed high-density development as the guiding principle for national urban development in the recently published National New-type Urbanization Plan (2014-2020),[103] which maintains that denser communities enable more efficient energy consumption and lower dependence on automobiles. The plan posts a strict limit on the "urban construction land" of no more than 100 square meter per capita, which amount to a urban density benchmark of 10,000 people per square kilometer (for comparison, New York City had approximately 10,425 people per square kilometer in

[102] "Double Increase and Double Decrease" policy: http://www.fzzx.sh.gov.cn/LT/AWUCO977.html
[103] National New-type Urbanization Plan (2014-2020): http://politics.people.com.cn/n/2014/0317/c1001-24649809.html

2013[104]). Since such high-density urban development is beyond most natural environmental carrying capacity, the Chinese government expresses strongly its preference for a "scientific development approach" in environmental management and restoration of the local ecosystem to achieve high-density urbanization.

Interestingly, China's new preference for high-density development coincides with a similar development in the global North. For example, David Owen, an influential environmental journalist, has been promoting the notion that New York and other big cities are most environmentally sustainable because of the high public transportation usage that lowers fossil fuel consumption and carbon emission for the average resident (Owen, 2009). This argument has been embraced by the current New York City mayor Bill de Blasio (de Blasio, 2014). Even Richard Register, the founder of Ecocity Builders, has also joined this high-density campaign in the recent Ecocity World Summit in 2013. All of these signify a shift in urban sustainability discourse away from the traditional discussions of environmental carrying capacity and the disruption of eco-metabolism, which are characteristic of low-density communities, to issues of resource consumption efficiency and carbon reduction associated more often with high-density development.

The Dongtan model and Tianjin model are embedded in this larger debate on urban design over the link between density and sustainability, and whether cities are parasitical on the environment, or the answer to environmental sustainability. As the new the National New-type Urbanization Plan promotes high-density urban development similar to the model used in Tianjin Eco-City, it is reasonable to predict that high-rise

[104] Converted from the data provided by the Department of City Planning of New York City http://www.nyc.gov/html/dcp/html/census/pop_facts.shtml

green buildings will dominate sustainable urban construction in China for the coming decade. What is less certain, however, is whether high-density green buildings are necessarily the best environmental sustainability design for all Chinese cities. This question is essential to interrogate the meaning of urban sustainability and understand the relation between Chinese cities with the environment.

Economic sustainability: lessons from urban mega projects

Economic sustainability has been an important question to eco-city development. Specifically, scholars are interested in what types of industries and associated employment opportunities can be created with developing eco-cities, and whether these economic activities can provide sustained growth. While these are all important issues, the influences of eco-cities on other aspects of the urban economy have been largely overlooked. Eco-city construction, first and foremost, is a particular form of urban mega project, which is a large-scale iconic urban development aimed to transferring and restructuring cities (Olds, 2001; del Cerro Santamaría, 2013a). Dongtan's sister project, the Thames Gateway development, for example, has been identified as London's new urban mega project used to both revitalize East London and cultivate a sustainable urban image for the city (Fainstein, 2008).

In the Asian context, urban mega projects often serve a dual function for helping individual cities compete in the global urban hierarchy, and also signaling the raising status of their respective societies (Diaz and Fainstein, 2008). In agreement with this

view, China's "eco-civilization" movement was strategically designed as a state project, being used to catch-up with and even surpass developed countries through pioneering the construction of eco-cities. As urban mega-projects, Chinese eco-cities have a far greater influence on urban economy than simply drawing new industries or creating new jobs: they require the formation of new political and economic alliance and the creation of new financial regulations to political, technically, and economically support the massive undertaking of planning and building new cities. Currently, however, research on eco-cities has not articulated with the literature on urban mega projects, and developed little discussions on alliance building and financing.

The prevalence of urban mega-projects has grown since the 1970s. As a result of fiscal constraints on government budgets, the state devolution, and the deepening influence of neoliberalism, cities started to pursue large and ambitious projects on their own (Altshuler and Luberoff, 2003). The popular project types include waterfront development, large infrastructure projects, mega-events and iconic buildings, and urban redevelopment plans. In seeking to finance these costly undertakings, cities have also undergone the transition from a mere managerial role in charge of service provisions and collective consumption to an entrepreneurial role that operates beyond the conventional budgetary constraints (Harvey, 1989; Leitner 1990). In particular, cities most often form private-public partnerships to fund projects expected to yield returns in the speculative value. By tracing the financing mechanisms, scholars have revealed the contentious nature of urban mega projects: while a strong growth coalition is essential to draw resources from the private sector and secure state budgetary support, the lack of

accountability and transparency over the planning and implementation of urban mega projects tends to create uneven returns to heavily favor particular social groups and economic sectors (Harvey, 1989; Leitner 1990; Fainstein, 2001; Moulaert, Rodriguez and Swyngedouw, 2003).

Dongtan and Tianjin Eco-Cities also bear such characteristics and criticism. From the very beginning, both projects were set up to operate in project-based public-private partnerships outside the regular government system. Dongtan was created under the collaboration between the consulting firm Arup and the Shanghai governmental investment platform, SIIC, a peculiar creation in China's post market reform era. Similar financing arrangements are popular in Chinese local prefectures, and presented as an innovative way to allow both real estate developers and local governments to engage in land speculation (Hsing, 2010). Even though Dongtan was never built, the site clearance, infrastructure improvement (particularity the Tunnel Bridge), and the potential for another large-scale development project have contributed to a drastic increase in local housing prices and a wave in vacation home construction across Chongming Island.[105] For Tianjin Eco-City, even though it is a public-public collaboration between the Chinese and Singapore governments, it still highly depends on the private sector for real estate development and allows land speculation in order to cover the construction cost of the eco-city. In this sense, eco-city projects are unlikely to meet their initial promises of a new, more egalitarian form of development. Rather, the construction may just reinforce

[105] According to an interview with a real estate agent in Chengqiaozhen on Chongming Island in October 2011, the real estate price at least triples since 2006.

the speculative development regime already in place, making eco-urbanism a form of "speculative urbanism" (Goldman, 2011).

Financing mechanisms are also crucial to understanding the production of eco-urbanism. Research on urban mega-projects has documented that financial feasibility is a crucial factor for a project's development and implementation (Fainstein, 2001; del Cerro Santamaría, 2013a). In the worst case, lack of financial support may result in a project's failure, as we have witnessed in Dongtan. Alternatively, projects may be altered due to financial constraints. In Tianjin's case, the anticipation of limited funding prompted the planners to take a more pragmatic and affordable approach in their techniques from the very beginning; while this compromise still did not fully resolve funding issues as the project proceeded, the governing body decided to change its planning features, further lowering the ratio of affordable housing in the project.

Further, the finance providers generally have dominant influence over decisions of urban mega-project development (Altshuler and Luberoff, 2003). In Dongtan's case, as documented by Wu (2012) and my interviews with Arup planners, SIIC were behind major planning decisions because it was the main financial provider as well as Arup's official client. Some noticeable features, including waterfront theme parks, western style housing as well as the yacht docks, were requested by SIIC, even before Arup started its design.[106] In contrast, the Chongming county government, the local governing body for the Dongtan project site, was almost powerless in the planning process.

[106] Interview with UKAP01 in November 2012.

Of course, the power of the finance provider and project client is not a breakthrough revelation. But as the financial schemes of eco-cities become more globalized and involve multiple public and private parties, the development process and the associated power balance may become more complicated. Studies on urban mega-projects have noted that new methods of financing and greater collaboration between public and private sectors are two new important trends since the 2000s, both of which are highly influenced by the broader process of global financialization and neoliberalization (Orueta and Fainstein, 2008; also see Fainstein, 2008; del Cerro Santamaría, 2013a; 2013b). From this perspective, studying the financial global networks may shed light on understanding other aspects of green urbanism production. While I have shown that both Dongtan and Tianjin Eco-Cities are embedded in global sustainable planning networks, what I have not been able to achieve is to demonstrate how globalized financing schemes influence and condition the preferred eco-urbanism models within these planning networks. Now as more and more international financial institutions, including the World Bank, the IMF, and regional development banks propose green development financing mechanisms to persuade cities to undergo a "sustainable turn," it is important to trace the financing mechanisms and examine these organizations' respective agendas. What kinds of sustainable development do these international financial institutions pursue? What are the implications on eco-urbanism? Will it lead to another round of urban "structural adjustment" disguised in the sustainable discourse? These are important questions for future eco-city and urban sustainability research.

Bibliography

Abramson, D. B. 2006. Urban planning in China: continuity and change. *Journal of the American Planning Association,* 72(2): 197–215.

Allen, J. and Cochrane, A. 2007. Beyond the territorial fix: regional assemblages, politics and power. *Regional Studies*, *41*(9): 1161-1175.

Altshuler, A. and Luberoff, D. 2003. *Mega-Projects: The Changing Politics of Urban Public Investment*. Washington, D. C.: Brookings Institution Press.

Anderson, B. and McFarlane, C. 2011. Assemblage and geography. *Area*, *43*(2): 124-127.

Arup. 2012. *SPeAR Handbook 2012 External Version*. London: Arup.

Arup. 2009. *Planning Low Carbon Cities in China*. Shanghai: Arup.

Arup. 2008. Dongtan Fact Sheet <http://www.worldarchitecturenews.com/index.php?fuseaction=wanappln.projectview&upload_id=2137> Accessed February 11, 2011.

Beatley, T. 1999. *Green Urbanism: Learning From European Cities.* Washington D.C.: Island Press.

Bergmann, L. 2013. Bound by chains of carbon: ecological–economic geographies of globalization. *Annals of the Association of American Geographers*, 103 (6): 1348-1370.

Brenhouse, H. 2001. Plans shrivel for chinese eco-city. *New York Times,* June 24, 2010. <http://www.nytimes.com/2010/06/25/business/energy-environment/25iht-rbogdong.html?_r=1> Accessed October 4, 2011.

Brenner, N. 2004. *New State Spaces: Urban Governance and the Rescaling of Statehood*. New York: Oxford University Press.

Brenner, N., Madden, D. J., and Wachsmuth, D. 2011. Assemblage urbanism and the challenges of critical urban theory. *City*, *15*(2), 225-240.

Brenner, N, and Theodore N. 2002. Cities and the geographies of "actually existing neoliberalism." *Antipode,* 34: 349-379.

Bulkeley, H. 2005. Reconfiguring environmental governance: towards a politics of scales and networks. *Political Geography,* 24: 875–902.

Buttel, F. H. 2000. Ecological modernization as social theory. *Geoforum*, 31(1): 57–65.

Campbell, S. 1996. Green Cities, growing Cities, just Cities? Urban Planning and the contradictions of sustainable development. *Journal of the American Planning Association,* 62 (3): 296-312.

Caprotti, F. 2014. Critical research on eco-cities? A walk through the Sino-Singapore Tianjin Eco-City, China. *Cities*, 36: 10-17.

Cartier, C. 1995. Singaporean investment in China: installing the Singapore model in Su'nan. *Chinese Environment and Development*, 6 (1&2): 117-144.

Chan, K. W. 2010. Fundamentals of China's urbanization and policy. *The China Review,* 10 (1): 63-94.

Chang, I. C., Leitner, H. and Sheppard, E. (forthcoming) A green leap forward? Eco-state restructuring and the Tianjin-Binhai Eco-City model, *Regional Studies*.

Chang, I. C. and Sheppard, E. 2013. China's eco-cities as variegated urban sustainability: Dongtan Eco-City and Chongming Eco-Island. *Journal of Urban Technology*, 20(1): 57-75.

Chen, C. J. 2009. Glowing social unrest and emergent protest groups in China. In: Xiao, X. and Z. Lin (eds.) *Rise of China: Beijing's Strategies and Implications for the Asia-Pacific*, pp. 87-106. New York: Routledge.

Chien, S.-S. 2013. Chinese eco-cities: a perspective of land-speculation-oriented local entrepreneurialism. *China Information*, *27*(2): 173-196.

Clark, M., Burall, P. and Roberts, P. 1993. A sustainable economy. In: Blowers, A. (ed) *Planning for a sustainable environment*. London: Earthscan.

Clarke, N. 2012a. Actually existing comparative urbanism: imitation and cosmopolitanism in North-South interurban partnership. *Urban Geography*, 33(6): 796-815.

Clarke, N. 2012b. Urban policy mobility, anti-politics, and histories of the transnational municipal movement. *Progress in Human Geography*, *36*(1): 25-43.

Cook, I. R. and Ward, K. 2012. Relational comparisons: the assembling of Cleveland's waterfront plan. *Urban Geography*, *33*(6): 774-795.

CSUS (Chinese Society for Urban Studies). 2011. The cases of Chinese eco-city. Research result presented at the Press Conference on Annual Achievements of Eco-city Assessment and Best practices (2010-2011). Beijing, March 29, 2011.

Cugurullo, F. 2013. How to build a sandcastle: an analysis of the genesis and development of Masdar city. *Journal of Urban Technology*, *20*(1): 23-37.

Davis, M. 2010. Who Will Build the Ark? *New Left Review* 61. <http://newleftreview.org/A2818> Accessed November 21, 2010.

Davidson, M. 2010. Sustainability as ideological praxis: The acting out of planning's master-signifier. *City*, *14*(4): 390-405.

de Blasio, B. 2014. A framework for a sustainable city. < http://dnwssx4l7gl7s.cloudfront.net/deblasio/default/page/-/One%20New%20York%2C%20Rising%20Together%20-%20Sustainable%20City.pdf> Accessed April 20, 2014.

de Jong, M. et al. 2013. Exploring the relevance of the eco-city concept in China: the case of Shenzhen Sino-Dutch low carbon city. *Journal of Urban Technology*, 20(1): 95–113.

del Cerro Santamaría, G. 2013a. Introduction. In: del Cerro Santamaría, G. (ed.) *Urban Megaprojects: A Worldwide View (Research in Urban Sociology, Volume 13)*, pp.xix-xlix. Bingley, UK: Emerald Group Publishing Limited.

del Cerro Santamaría, G. 2013b. Key Findings and Theoretical Implications. In: del Cerro Santamaría. G. (ed.) *Urban Megaprojects: A Worldwide View (Research in Urban Sociology, Volume 13)*, pp.317-335. Bingley, UK: Emerald Group Publishing Limited,

Department for Communities and Local Government. 2006. *Transferrable Lessons from the New Towns*. London: Department for Communities and Local Government.

Dolowitz, D. and Marsh, D. 1996. Who learns what from whom: a review of the policy transfer literature. *Political studies*, *44*(2), 343-357.

Dussauge-Laguna, M. I. 2012. On the past and future of policy transfer research: Benson and Jordan revisited. *Political studies review*, *10*(3), 313-324.

Economy, E. 2007. Environmental governance: the emerging economic dimension. In: Carter, N. and Mol, A. (eds.) *Environmental Governance in China*, pp.23-41. New York: Routledge.

Eng, T. S. 1986. New town planning and development in Singapore. *Third World Planning Review*, 8(3): 251-272.

Fainstein, S. 2008. Mega□projects in New York, London and Amsterdam. *International Journal of Urban and Regional Research*, 32(4): 768-785.

Fainstein, S. 2001. *The City Builders: Property Development in New York and London*. Kansas: University Press of Kansas.

Fan, C. 2005. Interprovincial migration, population redistribution and regional development in China: 1990 and 2000 census comparisons. *Professional Geographer*, 57(2): 295-311.

Fitzgerald, J. 2010. *Emerald Cities: Urban Sustainability and Economic Development.* New York: Oxford University Press.

Fox, J. 2010. China's zero-carbon city Dongtan delayed, but not necessarily dead, says Planner" *Treehugger,* January 24, 2010. <http://www.treehugger.com/files/2010/01/arup-peter-head-dongtan-interview.php> Accessed October 1, 2011.

Frey, H. 1999. *Designing the City: Towards a More Sustainable Urban Form*. New York: Routeledge.

Friedman, T. 2010. Who's sleeping now? *New York Times,* January 9 < http://www.nytimes.com/2010/01/10/opinion/10friedman.html?_r=0> Accessed October 1, 2011.

Geng, Y and Doberstein, B. 2008. Developing the circular economy in China: challenges and opportunities for achieving "leapfrog development." *International Journal of Sustainable Development & World Ecology*, 15(3):231–239.

Gibbs, D. 2009. Sustainability Entrepreneurs, Ecopreneurs and Development of a Sustainable Economy. *Greener Management International,* 55: 63-78.

Girardet, H. 2006. Which Way China? *Chinadialogue,* October 2, 2006. <http://www.chinadialogue.net/article/show/single/en/297-Which-way-China- > Accessed February 11, 2011.

Goldman, M. 2011. Speculative urbanism and the making of the next world city. *International Journal of Urban and Regional Research*, 35: 555–581.

Hald, M. 2009. *Sustainable Urban Development and the Chinese Eco-City: Concepts, Strategies, Policies and Assessments*. Oslo: Fridtjof Nansens Institute.

Hannertz U. 2003. Being there...and there...and there! Reflections on multi-site ethnography. *Ethnography,* 4: 201-216.

Hardoy, J., Mitlin, D. and Satterthwaite, D. 1999. The rural, regional and global impacts of cities in Africa, Asia and Latin America. In: Satterthwaite, D. (ed) *Sustinable Cities*, pp. 426-260. London: Earthscan.

Harris, A. and Moore, S. 2013. Planning histories and practices of circulating urban knowledge. *International Journal of Urban and Regional Research*, *37*(5): 1499-1509.

He, G. et al. 2012. Changes and challenges: China's environmental management in transition. *Environmental Development*, 3: 25-38.

Healey, P. 2013. Circuits of knowledge and techniques: the transnational flow of planning ideas and practices. *International Journal of Urban and Regional Research*, *37*(5): 1510-1526.

Hodson, M. and Marvin, S. 2009. Urban ecological security': a new urban paradigm? *International Journal of Urban and Regional Research,* 33: 193-215.

Hodson, M. and Marvin, S. 2010. Urbanism in the anthropocene: ecological urbanism or premium ecological enclaves?" *City,* 14(3): 298-313.

Hoffman, L. 2011. Urban modeling and contemporary technologies of city-building in china: the production of regimes of green urbanism. In: Roy, A. and Ong, A. (eds) *Worlding Cities: Asian Experiments and the Art of Being Global,* pp. 55-76. UK: Wiley-Blackwell.

Hsing, Y. T. 2006. Land and territorial politics in urban China. *China Quarterly*, 187: 575-591.

Hsing, Y. T. 2010. *The Great Urban Transformation: Politics of Land and Property in China*. Oxford: Oxford University Press.

Huang, Y. 2006. Urban Development in Contemporary china. In: Veeck, G., Pannel, C., Smith, C., and Huang, Y. (eds) *Globalization and the Dynamics of Political, Economic and social Chang*, pp. 233-266. Maryland: Rowman and Littlefield.

Hughes, C. 2006. *Chines Nationalism in the Global Era*. London: Routledge.

Hult, A. 2013. Swedish production of sustainable urban imaginaries in China. *Journal of Urban Technology*, 20(1): 77–94.

Jabareen, Y. R. 2006. Sustainable urban forms their typologies, models, and concepts, *Journal of Planning Education and Research*, 26(1): 38-52.

Jellinek, L. 2000. Jarkarta, Indonesia: kampung culture or consumer culture? In: Low, N., Gleeson B., Elander, I. and Lidskog, R. (eds) *Consuming Cities: The Urban Environment in the Global Economy after the Rio Declaration*, pp. 265-280. New York: Routledge.

Jessop, R. 2007. *State Power: A Strategic-relational Approach.* Cambridge, UK: Polity Press.

Jessop, R. and Sum, N-L. 2006. *Beyond the Regulation Approach: Putting capitalist economies in their place.* Cheltenham: Edward Elgar.

Joo, Y. M. 2013. New Town Developments in Korea: Then and Now. In: del Cerro Santamaría, G. (ed.) *Urban Megaprojects: A Worldwide View (Research in Urban Sociology, Volume 13)*, pp.3-25. Bingley, UK: Emerald Group Publishing Limited.

Joss, S. 2010. Eco-cities: a global survey 2009. *The Sustainable City VI: Urban Regeneration and Sustainability*, pp. 239-250. *Southampton*: *WIT Press.*

Joss, S. 2011. Eco-cities: the mainstreaming of urban sustainability: key characteristics and driving factors. *International Journal of Sustainable Development and Planning*, *6* (3): 268-285.

Joss, S. (ed.) 2012. *Tomorrow's City Today: Eco-City Indicators, Standards & Frameworks*. Bellagio Conference Report. London: University of Westminster.

Joss, S., Cowley, R., and Tomozeiu, D. 2013. Towards the "ubiquitous eco-city": an analysis of the internationalisation of eco-city policy and practice. *Urban Research & Practice*, *6* (1): 54-74.

Joss, S. and Molella, A. 2013. The Eco-City as Urban Technology: Perspectives on Caofeidian International Eco-City (China). *Journal of Urban Technology,* 20(1): 115–37.

Joss, S., Tomozeiu, D. and Cowley, R. 2011. *Eco-cities – A Global Survey 2011*. University of Westminster International Eco-cities Initiative. <http://www.westminster.ac.uk/__data/assets/pdf_file/0011/119909/pdf_research_ecocities_Global-Survey-updated.pdf> Accessed Feb 8, 2011.

Joss, S., Tomozeiu, D., and Cowley, R. 2012. Eco-city indicators: governance challenges. *The Sustainable City VII: Urban Regeneration and Sustainability*, 1109.

Kane, F. 2005. British to Help China Build "Eco-Cities." *The Observer* , November 6, 2005.

Kenworthy, J. 2006. The eco-city: ten key transportation and planning dimensions for sustainable city development. *Environment and Urbanization*, 18(1): 67-85.

Krueger, R. and Agyman, J. 2005. Sustainability schizophrenia or "actually existing sustainabilities"? Toward a broader understanding of the politics and promise of local sustainability in the US. *Geoforum,* 36: 410-417.

Krueger, R. and Gibbs, D (eds). 2007. *The sustainable development paradox: urban political economy in the United States and Europe.* New York: Guilford Press.

Kumar, A. and Krishan, A. 2000. Agenda 21 and urban India. In: Low, N., Gleeson B., Elander, I. and Lidskog, R. (eds) *Consuming Cities: The Urban Environment in the Global Economy after the Rio Declaration*, pp. 175-198. New York: Routledge.

Larner, W. and Laurie, N. 2010. Travelling technocrats, embodied knowledges: Globalising privatisation in telecoms and water. *Geoforum*, *41*(2), 218-226.

Leitner, H. 1990. Cities in Pursuit of Economic Growth. *Political Geography,* 9: 146-170.

Li, P. 2011. Sino-Singaporean Tianjin Eco-City: exploring green low carbon new town development (*zhōng xīn shēng tài chéng :tàn suǒ lǜ sè dī tàn xīn fǎ zhǎn zhī lù*). *Low Carbon World (dī tàn shì jiè)*, 9:60-63.

Lin, G. C. S. 2012. Strategizing urbanism in the era of neoliberalization: power reshuffling, land development, and municipal finance in urbanizing China. Paper presented at the conference on Urban Revolutions in the Age of Global Urbanism, Jakarta, March 17-21.

Liu, F. (2009) New trend in China's regional economic development. In: Saw, S. and Wong, J. (eds) *Regional Economic Development in China*, pp. 9-27. Singapore: Institute of Southeast Asian Studies.

Liu, J. and Dimond, J. 2008. Revolutionizing China's environmental protection. *Science*, 319 (5859): 37-38.

Lobo, B. 2013. Urban Megaprojects and Local Planning Frameworks in New York City, Paris, and Sao Paulo. In: del Cerro Santamaría, G. (ed.) *Urban Megaprojects: A Worldwide View (Research in Urban Sociology, Volume 13)*, pp.131-158. Bingley, UK: Emerald Group Publishing Limited.

London Thames Gateway Development Corporation, 2007a. *London Thames Gateway Futures: First Symposium for Researchers and Practitioners*. < http://www.ltgdc.rroom.net/think07/documents/ltgdc_symposium_brochure.pdf> Accessed March 18, 2014.

London Thames Gateway Development Corporation, 2007b. *Corporation Plan 2008-2011*. < http://www.ltgdc.rroom.net/uploaded/documents/corporateplan0811.pdf> Accessed March 18, 2014.

Low S. et al. 2009. Sustainable facilities: institutional compliance and the Sino-Singapore Tianjin Eco-City project. *Facilities*, 27(9-10): 368-386.

Ma, J. and Li, N. 2006. Tackling China's water crisis on line. *Chinadialogue,* September 21 < http://www.chinadialogue.net/article/show/single/en/392> Accessed June 10, 2012.

Markowski, T. and Rouba, H. 2000. Poland: on the way to a market economy. In Low, N., Gleeson B., Elander, I. and Lidskog, R. (eds) *Consuming Cities: The Urban Environment in the Global Economy after the Rio Declaration*, pp. 219-240. New York: Routledge.

Markowski, T. and Rouba, H. 2000. Poland: on the way to a market economy. In Low, N., Gleeson B., Elander, I. and Lidskog, R. (eds) *Consuming Cities: The Urban Environment in the Global Economy after the Rio Declaration*, pp. 219-240. New York: Routledge.

Massey, D. 2005. *For Space*. London: Sage.

Mason, K. and M. Whitehead, M. 2011. Transition urbanism and the contested politics of ethical place making. *Antipode*, 44(2): 439-516.

May, S. 2010. Dongtan, China. In: Cohen, N. (ed.) *Green Cities: An A-Z Guide.* Los Angeles: SAGE Publications.

May, S. 2011. Ecological urbanization: calculating values in an age of global climate change. In: Roy A. and Ong A. (eds) *Worlding Cities: Asian Experiments and the Art of Being Global,* pp. 98-126. UK: Wiley-Blackwell.

McCann, E. 2008. Expertise, truth, and urban policy mobilities: global circuits of knowledge in the development of Vancouver, Canada's "four pillar" drug strategy. *Environment and planning A*, *40*(4): 885.

McCann, E. 2011. Urban policy mobilities and global circuits of knowledge: toward a research agenda. *Annals of the Association of American Geographers*, *101*(1): 107-130.

McCann, E. 2013. Policy boosterism, policy mobilities, and the extrospective city. *Urban Geography*, *34*(1), 5-29.

McCann, E., Roy, A. and Ward, K. 2013. Assembling/Worlding Cities. *Urban Geography*, *34*(5): 581-589.

McCann, E., & Ward, K. 2010. Relationality/territoriality: toward a conceptualization of cities in the world. *Geoforum*, *41*(2): 175-184.

McCann, E. and Ward, K. 2011. (eds) *Mobile Urbanism*. Minnesota: University of Minnesota Press.

McCann, E. and K. Ward. 2012a. Assembling urbanism: following policies and "studying through" the site and situations of policy making. *Environment and Planning A*, 44: 42-51.

McCann, E. and Ward, K. 2012b. Policy assemblages, mobilities and mutations: toward a multidisciplinary conversation. *Political studies review*, *10*(3), 325-332.

Mcfarlane, C. 2010. The comparative city: knowledge, learning, urbanism. *International Journal of Urban and Regional Research,* 34(4): 725-742.

McFarlane, C. 2011a. *Learning the City: Knowledge and Translocal Assemblage*. Wiley-Blackwell.

McFarlane, C. 2011b. The city as a machine for learning. *Transactions of the Institute of British Geographers*, *36*(3), 360-376.

McGregor, A. I., and Roberts, C. 2003. Using the SPeAR TM assessment tool in sustainable master planning. In: *Proceedings of US Green Building Conference, Pittsburgh, PA, USA.* US Green Building Council, Pittsburgh, PA, USA.

Meadows, D. H. 1972. *The Limits to Growth; A Report for the Club of Rome's Project on the Predicament of Mankind.* New York: Universe Book.

Meadows, D. H. 1999. Indicators and information systems for sustainable development. In: Satterthwaite, D. (ed.) *The Earthscan Reader in Sustainable Cities*. London: Earthscan.

Ministry of Environment Protection. 1997. *The State of Environment in Chin 1996*, <http://english.mep.gov.cn/SOE/soechina1996/index.htm> Accessed May 5, 2012.

Mol, A. P. 2009. Urban environmental governance innovations in China. *Current Opinion in Environmental Sustainability*, 1(1), 96-100.

Mol, A. and Carter, N. 2007. China's environmental governance in transition. Carter, N. and Mol, A. (eds) *Environmental Governance in China*, pp.1-22. New York: Routledge.

Mol, A. and Spaargaren, G. 2000. Ecological modernisation theory in debate: a review. *Environmental politics*, 9(1): 17-49.

Moulaert, F., Rodríguez, A. and Swyngedouw, E. (eds.) 2003. *The Globalized City: Economic Restructuring and Social Polarization in European Cities*. Oxford: Oxford University Press.

Murdoch, J. 1997. Towards a geography of heterogeneous associations. *Progress in Human Geography*, *21*(3), 321-337.

Newsham, G. et al. 2009. Do LEED-certified buildings save energy? Yes, but…. *Energy and Buildings,* 41(8): 897–905.

Nijman, J. 2007. Introduction: comparative urbanism. *Urban Geography* 28: 1-6.

O'Connor, J. 1998. *Natural Causes: Essays in Ecological Marxism*. New York: Guilford.

Olds, K. 2002. *Globalization and urban change: Capital, culture, and Pacific Rim mega-projects*. Oxford: Oxford University Press.

Ong, A. 2006. *Neoliberalism as exception: Mutations in citizenship and sovereignty*, Durham: Duke University Press.

Orlans, H. 1952; 2013. *Stevenage: a sociological study of a new town*. New York: Routledge.

Orueta, F. D., and Fainstein, S. S. 2008. The new mega□projects: genesis and impacts. *International Journal of Urban and Regional Research*, 32 (4): 759-767.

Owen, D. 2009. *Green Metropolis: Why Living Smaller, Living Closer, and Driving Less Are the Keys to Sustainability*. New York: Penguin.

Padawangi, R. 2010. The planned suburbanization of a city-state: Singapore's new towns. In: Clapson, M. and Hutchison, R. (eds.) *Suburbanization in Global Society (Research in Urban Sociology, Volume 10)*, pp.293-317. Bingley, UK: Emerald Group Publishing Limited.

Page, J., Grange, N. and Kirkpatrick, N. 2008. The Integrated Resource Management (IRM) model–a guidance tool for sustainable urban design. Paper for PLEA 2008, 25th Conference on Passive and Low Energy Architecture, Dublin, 22-24, October 2008.

Peck, J. 2010. *Constructions of Neoliberal Reason*. Oxford, UK: Oxford University Press.

Peck, J. 2011. Geographies of policy: From transfer-diffusion to mobility-mutation. *Progress in Human Geography* 35(6): 773-797.

Peck, J. and Theodore, N. 2007. Variegated capitalism. *Progress in Human Geography* 31(6): 731-772.

Peck, J. and Theodore, N. 2010. Mobilizing policy: models, methods, and mutations. *Geoforum,* 41:169-174.

Peck, J. and Theodore, N. 2012. Follow the policy: a distended case approach. *Environment and Planning A*, *44*(1), 21.

Peck, J. and Zhang, J. 2013. A variety of capitalism...with Chinese characteristics? *Economic Geography*, doi: 10.1093/jeg/lbs058.

Pieterse, E. and Watson, V. 2009. Planning for Cities in the Global South: A research agenda for sustainable human settlements. *Progress in Planning* 72(2): 233–241.

Portney, K. E. 2003. *Taking Sustainable Cities Seriously: Economic Development, the Environment, and Quality of Life in American Cities*. Ambridge, MA: The MIT Press.

Pow, C. and Neo, H. 2010. Building ecotopia: critical reflection on eco-city development in China. In: Fook, L. and Gang, C. (eds) *Towards a Liveable and Sustainable Urban Development: Eco-cities in East Asia.* Singapore: World Scientific.

Pow, C. and Neo, H. 2013. Seeing red over green: contesting urban sustainabilities in China. *Urban Studies*, *50*(11): 2256-2274.

Prince, R. 2012. Policy transfer, consultants and the geographies of governance. *Progress in Human Geography*, *36*(2), 188-203.

Prudham, S. 2009. Pimping climate change: Richard Branson, global warming, and the performance of green capitalism. *Environment and Planning A,* 41: 1594-1613.

Prytherch , D. L. 2002. Selling the eco-entrepreneurial city: natural wonders and urban stratagems in Tucson, Arizona. *Urban Geography* 23 (8): 771-793.

Qiu, B. 2009. From green building to low-carbon eco-city. *Urban Studies* 7: 1-11. (in Mandarin)

Qiu, B. 2011. Current status, challenges and solutions: the past and future of Chinese eco-cities. Binhai-Forum low-carbon development and eco-city keynote speech at Binhai, Tianjin, China. September 23, 2011.

Rapoport, E. 2014. Utopian visions and real estate dreams: the eco□city past, present and future. *Geography Compass*, 8(2): 137-149.

Rees, W. and Wackernagel, M. 1996. Urban ecological footprints: why cities cannot be sustainable—and why they are a key to sustainability. *Environmental Impact Assessment Review*, 16(4): 223-248.

Register, R. 2002. *Ecocities: Building Cities in Balance with Nature*. California: Berkeley Hills Books.

Register, R. 2006. *Ecocities: Rebuilding Cities in Balance with Nature*. Canada: New Society Publishers.

Ren, X. 2011. *Building Globalization: Transnational Architecture Production in Urban China*. Chicago: University of Chicago Press.

Robertson, J. 1990. Alternative futures for cities. In: Cadman, D. and Payn, G. (eds) *The living City: Towards a sustainable future*, pp. 127-35. London: Routledge & Kegan Paul.

Robinson, J. 2002. Global and world cities: a view from off the map. *International Journal of Urban and Regional Research* 26(3): 531-554.

Robinson, J. 2006. *Ordinary Cities: Between Modernity and Development*. London, UK: Routledge.

Robinson, J. 2011a. Cities in a world of cities: the comparative gesture. *International Journal of Urban and Regional Research* 35(1): 1-23.

Robinson, J. 2011b. The spaces of circulating knowledge: city strategies and global urban governmentality. In: McCann, E. and Ward, K. (eds) *Mobile Urbanism*. Minnesota: University of Minnesota Press.

Rock, M. 2002. Integrating environmental and economic policy making in China and Taiwan. *American Behavioral Scientist*, 45(9):1435-1455.

Roseland, M. 1997. Dimensions of the eco-city. *Cities* 14(4): 197-202.

Roy, A. 2009. The 21st-Century Metropolis: New Geographies of Theory. *Regional Studies,* 43(6): 819-830.

Roy, A. 2011. Urbanisms, worlding practices and the theory of planning. *Planning Theory* 10: 6-15.

Roy, A., and Ong, A. 2011. *Worlding Cities: Asian Experiments and the Art of Being Global*. UK: Wiley-Blackwell.

Satterthwaite, D. 1997. Sustainable cities or cities that contribute to sustainable development? *Urban Studies*, 34(10): 1667-1691.

SCDIDC. 2005. *Dongtan Gong Si Fa Zhan Zhan Lue Ding Wei* (*Dongtan Company Development Strategy*), presentation at Chongming County Government. Month date unknown.

Scofield, J. 2009. Do LEED-certified buildings save energy? Not really…. *Energy and Buildings*, 41(12): 1386–1390.

Shanghai Development and Reform Commission. 2010. *Chong Ming Sheng Tai Dao Jian She Gang Yao* 2010-2020 (*Chongming Eco-Island Development Outline 2010-2020*) <http://www.cmx.gov.cn/html/shcm/shcm_zfxxgk_bdgh_cmstdgsgyun2010-2020nun/List/list_0.htm> Accessed October 1, 2011.

Shanghai Municipal Government. 2006. *Chong Ming San Dao Zong Ti Qui Hua* (*Chongming Three Island Master Plan*) <http://www.cmx.gov.cn/html/shcm/shcm_zfxxgk_bdgh_cmsdztgh/List/list_0.htm > Accessed October 1, 2011.

Shen, J. and Wu, F. 2012. Restless urban landscapes in China: a case study of three projects in Shanghai. *Journal of Urban Affairs*, 34(3), 255-277.

Sheppard, E., Leitner, H., and Maringanti, A. 2013. Provincializing global urbanism: a manifesto. *Urban Geography*, 34(7), 893-900.

Shwayri, S. T. 2013. A model Korean ubiquitous eco-city? The politics of making Songdo. *Journal of Urban Technology: 20*(1), 39-55.

Sigrist, P. 2009. Dongtan Eco City: A model of urban sustainability? *The Urban Reinventors Online Journal* 3/09 <http://urbanreinventors.net/3/sigrist/sigrist-urbanreinventors.pdf> Accessed February 8, 2010.

SIIC (Shanghai Industrial Investment Company). 2006. *Shanghai Dongtan: An Eco-City.* Shanghai: Shanghai Sanlian.

Simone, A. 2004. *For the City Yet to Come: Changing urban life in four African cities.* Durham, NC: Duke University Press.

Simone, A. 2010. *City Life from Jakarta to Dakar*. London: Routledge.

Smith, N. 1984/2008. *Uneven Development: Nature, Capital and the Production of Space.* Athens, GA: University of Georgia Press.

Sneddon, C. 2000. "Sustainability" in ecological economics, ecology and livelihoods: a review. *Progress in Human Geography*, 24(4):521-549.

SSTECAC (Sino-Singapore Tianjin Eco-City Administrative Committee). 2009. *Mater Plan of Sino-Singapore Tianjin Eco-City 2008-2020*. Tianjin: SSTECAC.

SSTECAC (Sino-Singapore Tianjin Eco-City Administrative Committee) and Blupath City Consulting. 2010. *Navigating The Eco-city (dǎo háng shēng tài chéng shì)*. Beijing: China Architecture and Building Press. (in Mandarin)

SSTECAC (Sino-Singapore Tianjin Eco-City Administrative Committee). unknown. *Sino-Singapore Tianjin Eco-City: A practical vision for sustainable living.* Tianjin: SSTECAC.

Surbana Urban Planning. 2013. *Red-Dotting the World.* Singapore: Surbana.

Suzuki, H. et al. 2010. *Eco^2 Cities: Ecological Cities as Economic Cities*. Washington D. C.: World Bank Publications.

Taylor, I. 2008. Eco-city: the green city of tomorrow but built today. *Focus Magazine,* 197: 44-52.

Temenos, C. and McCann, E. 2012. The local politics of policy mobility: learning, persuasion, and the production of a municipal sustainability fix. *Environment and Planning A*, *44*(6), 1389-1406.

Tianjin Binhai New Area. 2009. Tianjin Binhai New Area: a New Growth Pole for the Economic Development of China. Tianjin: Binhai District Government.

Tsui, K. and Wang, Y. 2004. Between separate stoves and a single menu: fiscal decentralization in China. *China Quarterly*, 177: 71-90.

UN Habitat. 2008. *State of the Worlds Cities 2008-2009: Harmonious Cities*. United Nations.

United Nations Centre for Human Settlements. 1996. *An Urbanizing World: Global Report on Human Settlements.* Oxford, UK: Oxford University Press.

Walker, R. and Buck, D. 2007. The Chinese road: cities in the transition to capitalism. *New Left Review*, 46: 39-68.

Wang, L. et al. 2010. Building for what and whom? New town development as planned suburbanization in China and India. In: Clapson, M. and Hutchison, R. (eds.) *Suburbanization in Global Society (Research in Urban Sociology, Volume 10)*, pp.319-345. Bingley, UK: Emerald Group Publishing Limited.

Wang, S. 2009. China rushes to build green cities (*zhōng guó qiǎng jiàn lǜ sè chéng shì*), *Common Wealth Magazine*, no. 436, December 2 <http://www.cw.com.tw/article/article.action?id=39624> Accessed May 1, 2012.

WCED. 1987. *Our Common Future.* Oxford, UK: Oxford University Press.

Wei, D. et al. 2009. Globalizing regional development in Sunan, China: does Suzhou Industrial Park fit a neo-Marshallian district model? *Regional Studies,* 43(3): 409–427.

While, A. et al. 2004. The environment and the entrepreneurial city: searching for the urban "sustainability fix" in Manchester and Leeds. *International Journal of Urban and Regional Research*, 28(3): 549-569.

While, A. et al. 2010. From sustainable development to carbon control: eco-state restructuring and the politics of urban and regional development. *Transactions of the Institute of British Geographers*, 35 (1): 76-93.

White, R. 2002. *Building the Ecological City*. Cambridge: Woodhead Publishing and CRC Press.

Wood, R. 2007. Dongtan Eco-City, Shanghai. Arup presentation at the Planning Institute of Australia National Congress at Perth WA. May 4, 2007. <http://www.arup.com/_assets/_download/8CFDEE1A-CC3E-EA1A-25FD80B2315B50FD.pdf> Accessed February 11, 2011.

World Bank. 2009. *Sino-Singapore Tianjin Eco-City: A Case Study of an Emerging Eco-City in China*. World Bank Technical Assistance Report. <file.h2o-china.com/user/130/2e.pdf> Accessed September 16, 2011.

World Bank. 2010. *Clean Development Mechanism in China*. Washington D. C.: World Bank.

Wu, F. 2010a. Pathways and challenges to "the workshop of the world": China's economic growth and urbanization in political economic perspectives. Paper presented at the conference on Making Global Cities and the World Economic Crisis. Shenzhen, January 1-8.

Wu F. 2010b. How neoliberal is China's reform? the origins of change during transition, *Eurasian Geography and Economics*, 51(5): 619–631.

Wu, F. 2012. China's Eco-cities. *Geoforum,* 43: 169-171.

Wu, F. 2013. Pathway and chellanges to the "workshop of the world": China's development regime in political economic perspective, unpublished manuscript.

Xie, P. et al. 2010. Research on eco-city index and best practices. *Urban Studies*, 17(7): 12-18. (in Mandarin)

Yang, B. and Dong, K. 2008. Theories and practices of eco-city planning with master plan of Singapore Eco-city in Tianjin as an Example. *City Planning Review* 8: 10-14. (in Mandarin)

Yeh, G. O., and Wu, F. 1999. The transformation of the urban planning system in China from a centrally-planned to transitional economy. *Progress in planning*, *51*(3), 167-252.

Yip, S. 2008. Eco-city: from concept to implementation with Shanghai Dongtan and Beijing Changxindian as cases. *City Planning Review* 8: 15-27. (in Mandarin)

Yuan, Z. et al. 2006. The circular economy: a new development strategy in China. *Journal of Industrial Ecology*, 10(1&2): 4–8.

Zh, Y. et al. 2009. The evolution of China's *in situ* urbanization and its planning and environmental implications: case studies from Quanzhou municipality. In: Sherbinin, A. D., Rahman, A. and Barbieri, A. F. (eds) *Urban Population–Environment Dynamics in the Developing World: Case Studies and Lessons Learned.* Paris: Committee for International Co-operation in National Research in Demography (CICRED), 213–246.

Zhang, J. 2012. From Hong Kong's capitalist fundamentals to Singapore's authoritarian governance: the policy mobility of neo-liberalising Shenzhen, China. *Urban Studies,* 49(13): 2853–2871.

Zhao, S. X. B. and Wong, K. K. K. 2002. The Sustainability Dilemma of China's Township and Village Enterprises: An Analysis from Spatial and Functional Perspectives. *Journal of Rural Studies,* 18: 257-273.

Zhou, F. and Shen, J. 2010. Deploying an Intelligent Transportation System in Chongming County, Shanghai. *Journal of Urban Technology,* 17(3): 39-51.

Zhou, L. and Ping, S. 2009. Bohai Rim's regional development: problems and policy options. In: Saw, S. and Wong, J. (eds) *Regional Economic Development in China*, pp.179-210. Singapore: Institute of Southeast Asian Studies.